ANNUAL REPORT

OF THE

DEPARTMENT OF THE INTERIOR

FOR THE

Fiscal Year ended March 31, 1922

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1923

To His Excellency The Right Honourable Lord Byng of Vimy, G.C.B., G.C.M.G., M.V.O., etc., Governor General and Commander in Chief of the Dominion of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of the transactions of the Department of the Interior for the fiscal year ending March 31, 1922.

Respectfully submitted,

CHARLES STEWART,
Minister of the Interior.

OTTAWA, September 1, 1922.

TABLE OF CONTENTS

PAGE

Report of Deputy Minister.. 5

PART I.—DOMINION LANDS.

Report of the Commissioner.. 39
" " Chief Inspector of Dominion Lands Agencies.. 39
" " Inspector of Dominion Lands Agencies, Manitoba and Saskatchewan.. 39
" " Dominion Lands Subagencies, Manitoba and Saskatchewan.. 40
" " Homestead Inspectors in Manitoba and Saskatchewan.. 40
" " Inspector of Dominion Lands Agencies, Alberta and British Columbia.. 41
" " Dominion Lands Subagencies, Alberta and British Columbia.. 41
" " Homestead Inspectors in Alberta and British Columbia.. 42
" " Agent of Dominion Lands, Battleford.. 42
" " " " " " Calgary.. 43
" " " " " " Dauphin.. 44
" " " " " " Edmonton.. 44
" " " " " " Grande Prairie.. 45
" " " " " " Kamloops.. 46
" " " " " " Lethbridge.. 47
" " " " " " Moose Jaw.. 47
" " " " " " New Westminster.. 48
" " " " " " Prince Albert.. 49
" " " " " " Peace River.. 49
" " " " " " Revelstoke.. 50
" " " " " " Saskatoon.. 51
" " " " " " Swift Current.. 51
" " " " " " Winnipeg.. 52
" " Land Patents Branch.. 53
" " School Lands Division.. 65
" " Mining Lands and Yukon Branch.. 70
" " Gold Commissioner and Crown Timber and Land Agent, Dawson 74
" " Inspecting Engineer, Mining Lands and Yukon Branch.. 77
" " Timber and Grazing Lands Branch.. 82
" " Superintendent of Dominion Timber Agencies.. 84
" " Ordnance and Admiralty Lands Branch.. 87
" " Financial Controller.. 90

PART II.—CANADIAN NATIONAL PARKS

Report of the Commissioner of National Parks.. 95
" " Superintendent of Rocky Mountains Park.. 118
Nationalities of visitors to Rocky Mountains Park.. 121

PART II—CANADIAN NATIONAL PARKS—*Concluded*

	PAGE
Report of the Secretary of the Alpine Club of Canada	122
" " Superintendent of Yoho and Glacier Parks	124
" " " Revelstoke Park	126
" " " Jasper Park	126
" " " Waterton Lakes Park	128
" " " Buffalo Park	130
" " " Elk Island Park	131
" " " Point Pelee Park	132
" " " St. Lawrence Islands Parks	133
" " Hon. Superintendent Fort Anne Park	133

PART III.—FORESTRY.

Report of the Director of Forestry	135
" " Chief of the Tree Planting Division	149
" " District Forest Inspector for Manitoba	151
" " " " " " Saskatchewan	154
" " " " " " Alberta	159
" " " " " " British Columbia	163
" " Superintendent of the Forest Products Laboratories	167

PART IV.—RECLAMATION

Report of the Director of the Reclamation Service	175
Report of Irrigation Surveys and Inspections	182
Report on Drainage Surveys and Inspections	202

PART V.—WATER POWER.

Report of the Director of Water Power	209

REPORT

OF THE

DEPARTMENT OF THE INTERIOR

1921-22

Hon. CHARLES STEWART,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the 49th Annual Report of the Department of the Interior for the fiscal year ended March 31, 1922.

The total area of the three Prairie Provinces is 485,642,698 acres, of which 30,853,020 acres are water. Of the total area 200,484,841 acres have been surveyed. Of the surveyed area 129,074,028 acres are held under homestead entry or other government grant, that for homesteads alone representing 54,339,100 acres. Dominion Parks and Forest reserves cover 25,094,400 acres, and school lands endowment 9,335,000 acres. The surveyed area now available for entry is 25,896,400 acres.

There was an increase of 1,960 in the number of homestead entries the past year, 7,349 being granted, compared with 5,839 the previous year. Manitoba showed the greatest percentage of increase, having more than doubled the number of the year before.

As was expected, the number of soldier grant entries declined, there being but 1,655 entries compared with 2,892 the previous year. This form of entry will gradually decrease with the lapse of time.

Letters patent issued were 13,116, accounting for 2,024,519 acres. This shows a decline in the three Prairie Provinces, but an increase in area is registered in the Northwest and Yukon Territories and in Dominion lands in British Columbia.

No school lands were offered for public sale by auction during the year, but approximately 44,400 acres were disposed of, at an average price of $13.30 per acre to the Soldier Settlement Board, railway companies and school districts.

The world-wide readjustment of financial conditions and the temporary lower earnings from agriculture were reflected in a reduced revenue from the sale of Dominion lands. The Hudson's Bay Company and the railway companies also felt the effect of the above conditions in a decrease of land sales and of the average price secured.

Outstanding features in the development of mineral resources were the continued activity in the new gold field in northern Manitoba, which bears evidence of being valuable; the more intensive development of the new silver-lead areas in the Mayo district, Yukon Territory; and the drilling for oil over very wide area throughout the west. The bringing in of producing oil wells in northern Montana has resulted in an increased amount of drilling on the Canadian side of the border.

The total quantity of timber cut on Dominion lands showed a slight decrease, but there were increases in some important lines. Timber licenses and permits in force cover approximately 6,250 square miles. The 6,578 grazing leases in force cover more than six million acres. Over five thousand permits to cut hay were granted.

The growth in the number of visitors to our National parks, noted in my report of last year, still continues and this year shows a large increase over the previous one. Good progress has been made on the construction of the Banff-Windermere highway, which is expected to be ready for travel next year, and which, no doubt will attract a large number of motorists.

The buffalo herd now numbers over 6,000 and must be reduced. Steps will be taken soon to dispose of about 1,000 of the surplus males.

The enforcement of the Migratory Birds Convention Act is resulting in a most encouraging increase of wild birds, especially wildfowl, throughout the Dominion.

The Historic Sites Board has recommended action in the case of some 600 sites and steps are being taken by the department to have them suitably marked.

Losses from forest fires were lighter than in the preceding year due partly to climatic conditions and partly to increased efficiency and better equipment of the forest protective organizations. Aeroplanes were for the second season successfully used in forest protection, the work being carried on in co-operation with the Air Board.

Greater interest was manifested than ever before in tree-planting on prairie farms and the work is steadily extending.

The work of forest research as regards the regeneration of forests, carried on at forest experiment stations in different parts of Canada, and as to the most efficient utilization of forest products, conducted at the Forest Products Laboratories, show steady progress.

During the year a total of 7,500 pounds of the seeds of Canadian trees was collected and shipped to Great Britain for use in reforestation work by the British Forestry Commission.

The increasing interest in irrigation is shown in the greater number of applications for water rights, 228 in 1921, compared with 196 in 1920 and 177 in 1919. Surveys and construction work have commenced on several large irrigation projects.

Drainage schemes for the reclamation of swamp lands in the Prairie Provinces have received much attention. Surveys have been made and plans suggested covering approximately 220,000 acres in the three provinces.

New water-power development to the extent of approximately 300,000 horse-power is reported for the year. This was practically all in Eastern Canada. Further development of the water-power of the Winnipeg river is under way, the Manitoba Power Company and the city of Winnipeg having power projects under way.

During the year in order to provide administration for the resources in the Northwest Territories, the Northwest Territories Branch was established and administrative offices were opened at Fort Smith with suboffices at Norman and Resolution. At these offices matters connected with the oil and other mineral resources, forests, lands, health, transportation, and educational institutions were dealt with during the year.

The scientific work of the observatories at Ottawa and Victoria has been continued. A large amount of data has been secured and compiled which is of much service to the country at large both directly and through governmental departments.

Evidence of the effect of the educational work concerning Canada's natural resources is seen in the widespread and growing interest therein, especially in Great Britain and the United States, 25,500 requests for information being received by the Natural Resources Intelligence Branch, as compared with 20,304 last year. Much has been done both to arouse and satisfy this demand by the use of lantern slides and lectures and by the distribution of literature.

With a view to improving the efficiency and effecting economy in administration, the Topographical Survey, Geodetic Survey, and International Boundary divisions have been amalgamated under Dr. E. Deville as Director General of Surveys.

The total revenue of the department from all sources for the year was $5,667,-419.79, compared with $10,189,596.52 for the preceding year, $3,312,090.74 of this decrease being accounted for in lessened sale of lands.

I append hereto a brief synopsis of the work of the various branches, followed by more detailed statements submitted by the head of each branch.

Your obedient servant,

W. W. CORY,
Deputy Minister.

OTTAWA, August 30, 1922.

LANDS PATENTS

LETTERS PATENT

The number of letters patent issued during the last fiscal year was 13,116, covering an area of 2,024,519 acres, being a decrease of 4,831 letters patent and a decrease in the area patented of 728,975 acres, as compared with the total area of the previous year. These totals were made up by provinces as follows:—

Province	Patents	Acres
Manitoba	2,395	362,175
Saskatchewan	5,551	883,043
Alberta	4,792	739,849
British Columbia	342	38,761
Yukon Territory	20	391
Northwest Territories	16	300
	13,116	2,024,519

HOMESTEAD ENTRIES

Homestead entries to the number of 7,349 were granted during the year, aggregating an approximate area of 1,175,840 acres, being an increase of 1,960 in the number of homestead entries granted as compared with the previous year.

Province	Entries
Manitoba	1,488
Saskatchewan	2,733
Alberta	2,928
British Columbia	200
	7,349

There were 1,655 soldier grant entries made during the year, aggregating approximately 264,800 acres, made up by provinces as follows:—

	Entries	Acres
Manitoba	383	61,280
Saskatchewan	590	94,400
Alberta	614	98,240
British Columbia	68	10,880
	1,655	264,800

There were 291 sales made during the fiscal year for 10,493 acres of land, with an average for each sale of about 36 acres.

ACCOUNTS AND REVENUE

During the fiscal year $742,451.72, including $165,790.25 interest on deferred payments, was received on account of purchased homesteads, pre-emptions and ordinary sales, being a decrease of $961,960.55 as compared with the payments received during the previous year.

The sum of $133,862.69 was received for entry fees, improvements and sundries, making a total revenue for the fiscal year of $876,314.41.

Refunds were made amounting to $55,428.86, as follows:—

Value of improvements collected on cancelled homesteads	$45,340 54
Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which had been cancelled	10,088 32
	$55,428 86

School Lands

Owing to the prevailing financial depression no school lands were offered for sale by public auction during the fiscal year ending March 31, 1922. A considerable area, however, was disposed of by private sale to the Soldier Settlement Board, railway companies, and school districts, as shown by the following statement:—

Province	Area	Value	Average per acre
Manitoba	4,065.01	$ 41,565 74	$10 22
Saskatchewan	35,340.66	475,031 18	13 44
Alberta	4,985.48	75,997 42	15 24

The net revenue derived from all sources for the fiscal year was as follows:—

Manitoba	$ 203,795 51
Saskatchewan	1,475,299 55
Alberta	602,688 53
Total	$2,281,783 59

The amount paid to the Government of each province, after deducting principal moneys and cost of administration, was as follows:—

Manitoba	$ 49,201 92
Saskatchewan	383,248 70
Alberta	256,149 61
Total	$ 688,600 23

The expenditure incurred was as follows:—

Manitoba	$ 16,292 16
Saskatchewan	49,947 00
Alberta	34,633 36
Total	$ 100,872 52

The amount standing to the credit of the fund of each province as on March 31, 1922, was as follows:—

Province	Total amount at credit of fund	Amount invested in debenture stock	Balance of fund uninvested
Manitoba	$ 5,635,839 74	$ 5,635,000 00	$839 74
Saskatchewan	12,027,514 84	12,027,000 00	514 84
Alberta	6,471,051 94	6,471,000 00	51 94

Mining Lands

Activity is being maintained, and continued interest is being manifested in the development of the mining resources on lands administered by this department. Coal mining in the western provinces continues to be the principal mining industry. Next in importance is placer mining in the Yukon Territory. Considerable quantities of the silver lead ores of the Mayo district in that territory are being mined for shipment to outside smelters. The amounts realized from shipments made last year were quite up to expectations, and the tonnage being mined for treatment is steadily increasing.

Prospects for obtaining oil in large quantities in that portion of southern Alberta adjacent to the international boundary are most encouraging, as several producing wells are reported to have been completed not far south of that boundary.

Everything that has occurred during the past year in connection with lode mining in northern Manitoba verifies the forecast that in that province this type of mining gives promise of developing into a great industry.

Timber and Grazing Lands

The total revenue derived from timber, grazing, and hay lands amounted to $723,322.81.

There were manufactured on licensed timber berths 188,227,507 feet board measure of lumber, in addition to large quantities of other materials, including 25,262,905 laths, 307,397 railway ties, 971,623 lineal feet of mining timber, etc. There were also manufactured under permits 41,972,406 feet board measure of lumber, besides other materials.

Ninety-one new timber berths were granted, which included one pulpwood berth covering a large area in the province of Manitoba. Timber berths held under license and permit cover 6,249 square miles.

There are 6,518 grazing leases in force, of which 581 were issued during the year. Over 5,000 permits to cut hay were taken out. The grazing leases cover a total area of 6,341,952 acres.

Canadian National Parks

The steady increase in travel to the Canadian National parks continues to be one of the most gratifying features in connection with the work. Last year practically every park showed an advance in the number of visitors, both foreign and Canadian. In the larger parks it is interesting to note an increased percentage of Canadians, in the smaller a much larger registration of people from a distance. The former shows that our own people are awakening to the attractions and recreational opportunities offered by these great reservations, the latter reveals that the smaller parks are outgrowing the local stage and are coming to be widely known. The greatest advance this year as well as last was in Waterton Lakes park, which was visited by approximately 20,000 visitors. This is rapidly becoming one of the most popular of the parks and in spite of its comparative isolation, it promises soon to rival some of the larger reservations along the main railway lines.

The chief work of importance was the prosecution of the Banff-Windermere highway. This road is now nearing completion and it is expected that it will be ready for travel by the coming spring, or a year in advance of the date set by the agreement between the Government of British Columbia and the Dominion. There is no doubt that as soon as this road is ready we may look for a tremendous increase in motor visitors. Requests for information as to the date of its opening have been received from practically every state in the union as well as all parts of Canada, and

it is anticipated that 10,000 cars will go over the road the first summer. An international traffic of this magnitude means much to this country both on account of the foreign revenue it will bring in and the increased international knowledge and good will that must inevitably result.

The Government buffalo herd continues to increase and now numbers over 6,000. This is as many as the present park can adequately support unless its boundaries are extended. The preponderance of males in the herd has also become too great for the welfare of the herd and it is probable that some disposal will be made of about 1,000 of these in the immediate future.

The results of the enforcement of the Migratory Birds Convention Act are shown in a most encouraging increase in wild bird life of many kinds. This is especially true of wildfowl where the beneficial effects of the prohibition of spring shooting are becoming widely evident. The staff of honorary wardens now numbers 1,722, including all forestry officers, and fishery officers along the Atlantic coast. It is found that a good deal of educational effort is still necessary with regard to the Act and special efforts were directed to this end. During the year over 125,000 pamphlets were distributed and approximately 35,000 posters. The most valuable publication was probably a small leaflet entitled "Lessons on Bird Protection," prepared for use in the schools, which has been approved and authorized by the ministers of education in each province. The extension of the work of the National Audubon Society to the Canadian schools was also an important step and one that will be of great educational value. The creation of bird sanctuaries is going steadily forward. An officer of the department spent considerable time investigating conditions on the north shore of the gulf of St. Lawrence and has recommended the creation of ten sanctuaries there. The creation of public shooting grounds which will ensure the public of a fair share of the game is also being considered and recommendations have been received from several of the provincial governments as to areas which they consider advisable.

Good progress has been made with the marking and preserving of the historic sites of national importance. Over 600 sites have been considered by the Historic Sites Board and recommendations as to the action which should be taken made to the department. Eighty-two of these have been selected to receive immediate attention. Attractive tablets, from a design prepared by the well-known Canadian artist, Ernest Fosberry, R.C.A., are now being cast in bronze to be used in connection with the marking of the selected sites, and a competition for designs for suitable landmarks will be initiated in the near future.

Forestry

Though the general commercial depression resulted in decreased revenues for the branch in some lines of its work, these decreases were offset by gains in other items of revenue, so that the total revenue of the branch shows a satisfactory increase for the year.

Losses from forest fires were considerably less than during the year 1920-21. The total number of fires was appreciably less, the proportion of large fires (i.e., those covering an area of ten acres or more) was also less, and the total area burned over was only about one-fourth of that burned the previous year. The season was exceptionally favourable in Manitoba and Saskatchewan, but in Alberta and the Salmon Arm district of British Columbia the fire-danger was exceptionally great. Improved organization of the fire-fighting force and the use of improved equipment both contributed to keep down the fires. The use of aeroplanes in the work of forest patrol and fire-fighting was a development of the year. These machines were used in the provinces of Manitoba, Alberta, and British Columbia with excellent results.

There was a decrease in the quantity of timber taken from the reserves, except in the case of fuel-wood, building logs, and railway ties. As might be expected from the depression in the grazing industry, the number of permits for grazing shows a slight decrease. Two new co-operative grazing associations were formed during the year; there are now over fifty of these associations pasturing cattle on the forest reserves.

A notable indication of the importance of Canada's forests to the Empire was the sending to the British Forestry Commission of 7,500 pounds of seed for use in afforestation in the British Isles. This was all seed of British Columbia coniferous species.

The number of trees distributed to farmers in the Prairie Provinces shows a gratifying increase, as does the number of new applicants for trees. The value of shelter-belts in increasing the comfort of the farmhome and in the growing of fruit trees, small fruits and tender vegetables is being more and more appreciated. The work of experimental planting and seeding on the reserves was continued.

The Forest Products Laboratories report an increasing number of requests for technical information and service. The research and investigative work is increasing, and good progress is reported in the various lines of work generally.

The silvicultural-research staff continued its work in the investigation of methods of handling forest areas in order to secure the highest possible continuous production. This work is being carried on in most of the provinces. Work on methods of estimating timber, of handling pulpwood species, of natural and artificial regeneration of the forest, and of handling timber sales under proper silvicultural methods has so far shown the most immediately useful results.

Reclamation

Irrigation.—In preparing for the extensive irrigation development which is now taking place in southern Alberta, the Reclamation Service has played a major part. Since 1894, when the Northwest Irrigation Act was passed, investigations of water supply and surveys of irrigable lands have been advocated and carried out well in advance of any strong demand for development of particular areas.

During the year a total of 228 applications for water rights of all kinds was received. When compared with 196 for the year 1920 and 177 for 1919, some idea is obtained of the steadily increasing demand for legal rights in water.

On October 4, 1921, the International Joint Commission defined the method of apportioning the waters of the St. Mary and Milk rivers and their tributaries in Montana, Alberta, and Saskatchewan. The uncertainty in connection with the development of irrigation projects depending upon these streams as a source of water supply is now largely removed and progress with these projects may be expected in the near future.

An area of 9,400 acres was irrigated this year by the Canada Land and Irrigation Company, as compared with 4,200 acres in the year 1920. Over 10,000 acres were irrigated in the Taber Irrigation District project, as compared with 2,000 acres in 1920. Both of these projects were operated for the first time in 1920.

Construction was commenced on the Lethbridge Northern Irrigation District project during the year and it is expected that both this and the United Irrigation District, on which construction will be commenced in 1922, will be in readiness for operation in the spring of 1923.

Surveys of the Lethbridge Southeast project were completed this year and estimates of cost were prepared during the winter months. Another large project now being investigated in detail is the North Saskatchewan project for the irrigation

of a tract of approximately 1,700,000 acres to the northeast of the Canadian Pacific Railway Irrigation block. Surveys of other projects near Lethbridge and Medicine Hat were followed up during the year and in some cases completed. It is expected that the construction of several of these projects will soon be commenced. A full account of each will be found in the part of this report describing more fully the work of the Reclamation Service.

Duty of water experiments were continued at Brooks, Vauxhall, and Coaldale, with excellent results. A very valuable collection of data has been obtained on the basis of which a special bulletin is being prepared. This bulletin, which should be exceedingly useful to irrigators in Western Canada, will be printed in pamphlet form for distribution.

Drainage.—The Drainage Division of the Reclamation Service was organized in 1919. A few parties were sent out in that year but it was only possible to do reconnaissance work. In 1920 and 1921, with a full staff and a well planned programme, more important investigations were undertaken and much valuable information was obtained of the nature and extent of submerged and swampy areas in Alberta, Manitoba and Saskatchewan. Projects comprising approximately 220,000 acres of swamp and submerged land have been recommended as suitable for Governmental reclamation.

As an experiment in the reclamation of Crown lands, the Reclamation Service has undertaken to drain Waterhen lake near Kinistino, Saskatchewan. Contracts for work on this project were let early this year and construction proceeded actively throughout the season. It is expected that the works will be completed in the autumn of 1922.

Surveys of areas requiring drainage are being proceeded with along similar lines to those that have been followed in connection with irrigation development. The way is being prepared for the drainage of these areas by districts organized for co-operative effort under provincial laws.

Surveys of the Carrot River Triangle project were commenced in the spring of this year. This tract lies near the town of Pas, Manitoba, between the South Saskatchewan and Carrot rivers and comprises approximately 1,100 square miles. So much of this area is inaccessible during the summer months that the parties working on it were kept in the field well into the winter. The soil of the area seems eminently suitable for agriculture and should the project prove economically feasible its construction would mean much to this northern district, in which considerable mining development is now taking place.

Twenty-five applications were received during the year for permission to construct small projects. These were investigated and, where favourable consideration was given, the necessary surveys were made and plans prepared. The general progress of the various schemes under development has been satisfactory.

Water Power

An analysis of the general water-power situation throughout the Dominion made by the Dominion Water Power Branch indicates that the total installation now totals 2,763,000 horse-power, the increase during the past fiscal year amounting to 300,000 horse-power. Unlike last year, much of this increase is due to entirely new construction and, as it is unusual for any power site to be developed to full capacity in a single stage, extensions to these new plants will continue to show from year to year a steady increase in horse-power installed.

The increase in power installation during the past year above noted, although a record for the Dominion was practically confined to eastern Canada. West of Ontario conditions are only now beginning to be satisfactory for the initiation of large

projects. That the lull in the hydro-electric enterprise noted since the outbreak of the great war is now ended is evidenced by the activity of the Manitoba Power Company at Great Falls, on the Winnipeg river, where an initial development of 56,000 horse-power is now in progress. The ultimate capacity of this site is 168,000 horse-power and its development is the first notable new enterprise of its kind undertaken west of the Great Lakes for nearly a decade.

The city of Winnipeg municipal plant at Pointe du Bois, on the Winnipeg river, first delivered power in October, 1911, and in the ten years since the completion of the initial installation has been steadily increasing its output and adding new units until its development to maximum capacity is nearly accomplished. The city's engineers are now making detail surveys at Slave falls, some five miles down stream for the construction of a new development which will be required in a comparatively short time.

The price of coal and the general unsettled state of that industry coupled with an easing of the financial situation and increased stability in the matter of labour and materials are bringing about a definite public preference for hydro-electric energy. There can be little doubt therefore that Canada, already famous for her water powers is on the eve of still greater achievements in this direction.

The general departmental progress in water-power matters has been distinctly satisfactory during the past year. The new Dominion Water Power Regulations, which had for some years been engaging the attention of officials of the Dominion Water Power Branch in the closest research, were promulgated by Order in Council of October 31, 1921. While no doubt experience will indicate the necessity for certain changes or provisions in these regulations, it is nevertheless believed that they form the most up-to-date and workable regulations yet evolved which, at the same time, protect the public interest and offer reasonable attraction to private corporate enterprise.

The Hydrometric Survey of Canada instituted by Order in Council of July 19, 1920, established a uniform system of basic water resource investigatory effort across the Dominion.

The Water Resources Index-Inventory work has been continued with satisfactory results, the collation of data regarding water-power development and water resources generally throughout the Dominion was substantially increased. This inventory makes it possible to place government officials, Dominion or provincial, and members of the general public interested therein in immediate touch with the most up-to-date and authentic information obtainable.

SURVEYS

TOPOGRAPHICAL SURVEYS BRANCH

Details of the work of the Topographical Surveys Branch are presented in complete form in the annual report of the branch, which is issued as a separate publication of the department; the following is a brief summary of what was accomplished during the year.

Thirty-seven parties were engaged in field work as compared with forty-five parties during the season of 1920-21. Of this number, four were employed in Manitoba, five in Saskatchewan, five in Alberta, three in the Railway Belt of British Columbia, sixteen partly in one province and partly in another, and three were employed in the Mackenzie River district, Northwest Territories.

Mackenzie River Surveys.—Perhaps the most interesting feature of the season's survey programme was the work accomplished in the Mackenzie River district. It consisted of an accurate survey of the main waterways—Slave river, Great Slave lake, and Mackenzie river—from the 30th base line to a point 110 miles below Nor-

man. Control during the course of the survey was obtained by a combination of chained bases with methods of triangulation and stadia adapted to the form of the traverse and the physical characteristics of the shoreline.

Operations extended over a distance of 1,000 miles involving the survey of more than 4,000 miles of shoreline and the erection of monuments at intervals of from two to five miles.

Three parties co-operated in the work and considering the distances in that country, the difficulties of transportation and conditions under which operations had to be carried on, the results obtained were remarkable. The surveys are intended to provide control for the survey of mineral claims, oil leases, and other surveys resulting from recent important discoveries of oil and minerals in that district. Much additional work of an exploratory nature which will assist materially in the development of the valuable resources of the district was also completed.

Topographical Surveys.—Topographical surveys for the revision of four sectional maps were completed by as many parties, which brings the total number of these sheets which have been revised to seventeen, eleven of which are available for distribution. The areas covered by these sheets are confined principally to the vicinities of important centres of population and comprise Dufferin, Emerson, Brandon, and Winnipeg sheets in Manitoba; Moose Jaw, Regina, and Saskatoon sheets in Saskatchewan; and Blackfoot, Red Deer, Peace Hills, and Edmonton sheets in Alberta. The maps are greatly in demand and many letters expressing appreciation of their excellence and utility have been received.

One party, employing photographic methods, was engaged on revision work in the Railway Belt of British Columbia, where ordinary methods of survey are impracticable for this purpose, on account of the rough nature of the country.

In compliance with a request from the Forestry Branch of this department, another party undertook a plane-table topographical survey of Cypress Hills forest reserve. The purpose of this survey is to make available for general administrative purposes a map which will, with reasonable accuracy, show the topography of the area and serve for developing detailed forest management of the reserve.

Land Classification Surveys.—Three parties were employed upon detailed land classification surveys. One party was engaged upon reconnaissance work in a comparatively unsettled district to determine what lands should be given a more detailed examination at a later date.

The classification of lands for settlement purposes has been one of the most important features of the activities of the Topographical Surveys Branch since 1918. Some seventeen million acres have been examined and classified to date and maps, plans, and reports showing the results of these surveys are available for Peace River and Saint Paul des Metis districts in Alberta, Prince Albert district in Saskatchewan, and the district between lakes Manitoba and Winnipegosis in Manitoba.

Stadia Surveys.—The stadia survey of water areas for the purpose of revising the plans of townships surveyed many years ago and in which many of the lakes have partially or completely dried up was continued by four parties as compared with eleven parties employed during the previous season. This work was begun in 1913 and is now almost completed.

Interprovincial Boundary Surveys.—Two parties were engaged upon the continuation of the survey of the boundary between the provinces of Alberta and British Columbia. The survey of this line has been in progress for several years, and that portion lying between the International Boundary and Yoll wlead pass is now completely surveyed, as well as part of the 120th meridian where it forms the boundary between these provinces in the Peace River district.

Another party was employed upon the delimitation of the boundary between the provinces of Manitoba and Ontario, northerly from Winnipeg river.

These surveys, involving as they do the question of jurisdiction, not only as to the ownership of land, but also to the application of provincial laws and the administration of justice, are both necessary and important.

Levelling Operations.—Seven parties were employed upon the further extension of levels, a total of 3,638 miles being run. A record of the elevations of a district is essential to its economic development and in the absence of such a record, questions such as the feasibility of constructing railways, the drainage of wet areas, the improvement of rivers for various purposes, and many other matters on which the development of the country depends cannot be satisfactorily dealt with. Since the inception of levelling by this branch in 1908, more than 34,000 miles of levels have been run.

Miscellaneous Surveys and Resurveys.—As in previous years, there was an urgent demand for small resurveys and scattered miscellaneous surveys. These necessitated the employment of three travelling parties. Some work of this class was also accomplished by two parties employed upon the survey of additions to several small townsites.

Subdivision Surveys.—Only three parties as compared with nine for the previous season were employed upon subdivision surveys in Manitoba, Saskatchewan, and Alberta. Two parties were engaged for part of the season on subdivision in the Railway Belt of British Columbia, the remainder of the season being devoted to miscellaneous work and the collection of information for sectional map revision.

General.—The foregoing summary of the work of the Topographical Surveys Branch reviewed in the light of similar statements appearing in the reports of the Department of the Interior for the years preceding the war, reveals a gradual but nevertheless a decided change in the activities of the branch.

Topographic land classification, exploratory and other important classes of surveys are now being given more attention. Reductions in the appropriations for surveys during the past four years, made necessary by conditions brought about by the war, have prevented extensive development.

Topographic surveys have been in progress in Canada for some years and a considerable amount, including surveys executed by the use of photographic methods, has been done by this branch. A limited number of parties have been employed in the western provinces on small scale topographical work, and the results of the surveys have been most satisfactory. The object is to complete a rapid survey on a smaller scale than one mile to an inch and the methods employed, although not absolutely accurate, are most economical and yield results sufficient for practical purposes.

Much of the information required is already available in the form of sectional maps which have been issued by the branch for many years. Valuable data also are obtained from the various provincial, municipal and railway offices. The field work is conducted by small parties which, travelling rapidly over the country, secure by expeditious methods information regarding topography, elevations, roads, improvements and other data not otherwise available. The whole is co-ordinated and the maps, which are compiled and drawn by the surveyors in charge of the field parties, are printed in the office. In the open country, a survey party can revise one sheet, or 4,300 square miles, in a season at a cost of approximately $1.42 a square mile.

Land classification surveys were first undertaken at the request of the Soldier Settlement Board, a number of Dominion land surveyors on the staff of the branch being selected to obtain information required in settling returned soldiers on the land. The result of these surveys has contributed much to the efficiency of the work of the board and has proven of great benefit to settlers in general. The greatest value of the work lies in its use in the intelligent direction of the settlement and early

development of new lands by providing intending settlers with accurate and reliable information which will assist them in selecting homesteads in suitable districts.

GEODETIC SURVEY

During the past fiscal year marked progress has been made in extending the Geodetic Survey over the Dominion of Canada, thus laying a foundation upon which accurate maps of the country are based, and also furnishing the control necessary for all other surveys.

The Anticosti Island Base Line was prepared and measured during the year. This base line is nearly twelve and a half kilometres (7¾ miles) long, and will serve as a splendid control for the scale of the triangulation on the lower St. Lawrence.

Geodetic astronomy comprised the occupation of two Laplace stations, West Base on Anticosti island, and Derby in the Cape Breton triangulation net; also the observing of the azimuth of the line Cap-Chat to Castor on the St. Lawrence triangulation.

This year saw the completion of the reconnaissance survey along the east coast of New Brunswick from the bay of Fundy to the bay of Chaleur, and in eastern Nova Scotia the triangulation to the vicinity of Sydney.

Agreements were made with the provincial forest services of New Brunswick and Quebec for a division of the cost of towers which are required by this Survey on certain triangulation stations to obtain the necessary intervisibility of stations and by the forest services as look-out towers for the detection and localization of forest fires.

In Quebec the reconnaissance for primary triangulation on the Saguenay river was partly completed, while the reconnaissance on the western half of Anticosti island was finished. Tower building was carried on at the stations at the west end and along the southwest coast of Anticosti island, and along the Gaspe coast opposite. Angle measuring observations were taken on all primary and secondary triangulation stations, together with lighthouses and other points of interest along the gulf of St. Lawrence in the area bounded on the west side by a line joining Point-des-Monts lighthouse on the north shore and Cap-Chat lighthouse on the south shore, and on the east side by a line joining Thunder river on the north shore and St. Antoine village on the south shore. Triangulation stations, one primary and one secondary, were established on Mount Albert in the Shickshock mountains.

The work in Quebec also included the location of the necessary points for the control of the aerial survey carried on in the hills north of Ottawa. These points were located by triangulation and traverse and their elevations determined.

Primary triangulation, city triangulation, precise levelling, and precise traverse comprised the operations in Ontario.

In the spring of 1921 an arrangement was made between the United States Coast and Geodetic Survey and the Geodetic Survey of Canada for co-operative action in extending a primary triangulation net along the 49th parallel International Boundary to form a basis for all future triangulation work which may be required in the West. It was agreed that the Canadian portion of this survey should extend from the lake of the Woods to the 109th meridian and that the United States parties should survey the section between the 109th meridian and the Pacific coast. Reconnaissance covering about 500 miles of the Canadian section was completed.

In British Columbia reconnaissance was carried up the Fraser river from Vancouver to Kamloops. Through the co-operation of the Air Board a hydroplane was available for this work. Along the coast reconnaissance and primary triangulation were continued between Namu and Prince Rupert. This section of primary trian-

gulation is part of an international co-ordinated scheme for triangulation control along the Pacific coast through northern United States, British Columbia, south-eastern Alaska, Yukon and the main part of Alaska.

Nine hundred and eighty-five miles of precise levelling were added to the level net, making the total amount to date 15,016 miles. Three hundred and eighty-four permanent bench-marks were established, bringing the total number at the present time to 4,544.

It is to be noted that the lines of precise levels which have been run by the national geodetic organizations of the United States and Canada will strengthen the precise level nets of the two countries.

INTERNATIONAL BOUNDARY

The surveying operations in connection with the demarcation of the International boundary along the different sections from the Arctic ocean to the Atlantic, a total distance of 4,083 miles, have been practically completed.

The boundary line as defined in the different treaties follows in many places along the middle of rather small, tortuous streams and in order to have a practical line of demarcation it was necessary to define a great number of short courses. Most accurate traverses were necessary, and the length and direction of each course were determined.

These conditions were found between the height of land and the Rainy lake on the Ontario-Minnesota boundary, along Monument brook at the head of the St. Croix river between Maine and New Brunswick, and along the southwest branch of the St. John river between Quebec and Maine.

One party operated on the St. Croix river and another on the Ontario-Minnesota boundary, through the Rainy Lake system. They each worked in connection with a United States party.

A party, headed by the engineers to the Canadian and United States sections of the commission, made an inspection of the boundary line and an examination of the monuments between the gulf of Georgia and the summit of the Rocky mountains. A number of monuments have been damaged and will have to be replaced or repaired. It was strongly urged by the customs and immigration officers that the vista which was cut out fifteen years ago, be reopened; particularly in the vicinity of the different customs houses. It is so overgrown in many places, particularly across the Fraser delta, that there is no indication of the line.

The report on the re-establishment of the boundary from the 49th Parallel through the gulf of Georgia, and through the straits of Juan de Fuca to the Pacific ocean, was submitted to Parliament and distributed to the public.

During the year eighteen maps of the 49th Parallel series were engraved and printed, nine of the section from the St. Lawrence to the bay of Fundy and four of the British Columbia and S.E. Alaska section.

NORTHWEST TERRITORIES

The oil strike on the Mackenzie river, in August, 1920, approximately 50 miles north of Fort Norman, Northwest Territories, was given wide publicity by the newspapers and magazines throughout Canada and the United States. All indications pointed to an oil stampede into the Mackenzie district on the opening of navigation in 1921, and it was deemed advisable to establish the Northwest Territories Branch in Ottawa for the purpose of administering the natural resources and transacting departmental business pertaining to those territories.

An administrative party was despatched to Fort Smith, via Peace river. This party, consisting of a recorder, subrecorders, foremen carpenters and other workers, with supplies for the erection of suitable buildings, office equipment, and stationery, left Peace River on May 5, 1921, in two scows, with thirty tons of supplies, and arrived at Fort Smith, without mishap, on the 26th of the same month.

Arrangements had been made with the Department of Indian Affairs to secure sufficient logs and lumber for the construction of buildings at Fort Smith, but on arrival the administrative party found there were no logs or lumber available. Owing to the scarcity of labour the Indian agent at Fort Smith had not been able to secure the materials.

It was necessary to purchase two teams, wagons, etc., to transport the freight over the portage between Fitzgerald and Fort Smith, as the tractors and local teams were kept busy hauling supplies for the oil and transportation companies, prospectors, etc.

Immediate steps were taken to secure logs and lumber for the erection of permanent buildings at Fort Smith and to establish Crown Timber, Land, and Mining Recording offices for the district. The Recording office at Fort Smith was permanently opened for business on July 1, 1921, and subsequently suboffices were opened at Norman and Resolution. For the purpose of accepting applications from persons who had travelled from the Pacific coast, the mining recorders at Dawson, New Westminster and Edmonton were made temporary subrecorders for the Mackenzie district.

ADMINISTRATION AND INSPECTION

The administration building at Fort Smith was completed on August 15, 1921. Settlers, prospectors and tourists were furnished with all possible information regarding the natural resources of the Northwest Territories and every effort was made to facilitate the development of the country.

Timber regulations, applicable to the Mackenzie district, were drafted and authorized, and steps taken for their enforcement.

An inspection was made of all settlement lots and the outstanding claims for free grants or purchases were satisfactorily dealt with after the extinguishment of the Indian Title in October, 1921. In each of the settlements one or two lots were reserved for Government purposes in the event of the establishment of land agencies, radio-telegraph stations, aerodromes, etc.

At the request of the Dominion Statistician the census of the white population of the Northwest Territories was taken, also the census of the Eskimo of the Mackenzie delta.

The appointment of officials and the drafting of forms to be used for registering births, marriages, and deaths in the Northwest Territories were taken up with the Bureau of Statistics. New forms, which it is presumed will cover the requirements for some years, are in course of preparation and will be distributed during open navigation this year.

The annual return up to December 31, 1921, showing the number of permits issued by the Commissioner, to import liquor into the Northwest Territories for medicinal and sacramental purposes, was laid before Parliament on March 22, 1922. The number of permits issued was 81 for 207½ gallons, including 70 gallons of sacramental wine.

It was decided to maintain the office of the Mining Recorder, Crown Timber and Land Agent at Fort Smith during the winter, and keep open the Mining Recording suboffice at Norman. There was a staff of seven at Fort Smith, and of two at Norman. Reports from these outlying points, have reached this office by every available mail.

During the temporary absence of the postmaster at Fort Smith the mining recorder acted in that capacity, and a report on mail conditions generally was submitted to the Post Office Department which has resulted in increased mail facilities for 1922.

The administration of the Northwest Game Act was transferred in the course of the year from the Commissioner of Dominion Parks together with the administration of the Wood Bison herds near Fort Smith, and the reindeer herd at Lobster Bay, Quebec.

HOSPITALS AND HEALTH

In the inspection of the settlements, hospitals, boarding schools, and day schools were visited, and a grant to the hospitals in the Mackenzie district was arranged, for all patients, on a per capita per diem basis.

The Royal Canadian Mounted Police reported that, in the Coronation Gulf district, infanticide, particularly in the case of females, was practiced by some of the Eskimo. When a tribe was on the march, and a female child was born it gave the parents more or less trouble, and quite frequently the infant was destroyed. As a result a number of Eskimo tribes were reported to be decreasing. This condition led to an appropriation of $1,500 to be expended in the purchase of wearing apparel, flour, needles, thread, and similar articles, which will be distributed by the Royal Canadian Mounted Police to Eskimo parents with children under five years of age, as an inducement to retain and bring up their children. This condition of affairs is limited to the Coronation Gulf district.

During the summer of 1921 an epidemic of smallpox broke out among the natives in northern Alberta and the disease spread into the Northwest Territories. With the aid of additional medical health officers, Royal Canadian Mounted Police and the hospitals, the epidemic was successfully combated and finally stamped out. Provision has been made for additional medical assistance in the Norman area.

ROADS, TRADE, AND NAVIGATION

The saw-mill at Fitzgerald, owned and operated by the Department of Indian Affairs, was transferred to this department during the past winter. At the same time the staff of the mining recorder, who remained at Fort Smith during the winter, took out a quantity of logs which will be turned into lumber ready for delivery, on the opening of navigation, to settlers and prospectors who have been unable to secure building material from private sources.

During the winter considerable preliminary work was done on a new highway from the Alberta boundary to the centre of the settlement at Fort Smith.

The Union Bank of Canada opened a Branch at Fort Smith in June, 1921, affording banking facilities for Government offices as well as for the public generally. This convenience was greatly appreciated by the settlers and prospectors.

Experimental farming operations which were carried on by the Indian Agent at Fort Smith have been discontinued and the stock and implements transferred to the mining recorder. A certain amount of land was broken in the fall and seeding operations will, no doubt, be commenced in the spring.

On behalf of the Department of Marine and Fisheries aids to navigation were established on the Athabaska, Slave, and Mackenzie rivers, which proved of great benefit to prospectors and the transportation companies.

ARCTIC EXPEDITION

Owing to the necessity for an extensive inspection and the placing of additional administrative posts on the islands of the Arctic archipelago, the northern exploration ship *Arctic*, which had been on lightship duty in the gulf of St. Lawrence for several years, was transferred from the Department of Marine and Fisheries to the Department of the Interior and was overhauled and outfitted for a trip to the north. The work of preparation was all but completed in 1921, but it was finally decided to postpone the sending of the expedition. The conduct of the expedition was placed in the charge of the Northwest Territories Branch and at the end of the fiscal year it was anticipated that preparations would be completed and that the *Arctic* would make the trip to the north in the season of 1922.

NORTHWEST COUNCIL

In order to deal with the increased work the Northwest Council was increased from four to six members and is now composed as follows:—

Commissioner—

W. W. Cory, C.M.G., Deputy Minister of the Interior.

Deputy Commissioner—

Roy A. Gibson, Assistant Deputy Minister of the Interior.

Councillors—

J. W. Greenway, Commissioner of Dominion Lands.
Dr. Charles Camsell, Deputy Minister, Department of Mines.
H. H. Rowatt, Superintendent of Mining Lands Branch, Department of the Interior.
O. S. Finnie, Director of the Northwest Territories Branch, Department of the Interior.
Lt.-Col. Cortlandt Starnes, Assistant Commissioner, Royal Canadian Mounted Police.

The council is composed wholly of officers of the Dominion Government who perform their council duties without any extra remuneration.

NORTHWEST TERRITORIES REVENUE

STATEMENT—Revenue collected in the Northwest Territories in the fiscal year 1921-22.

	$ cts.	$ cts.
Dominion Lands—		
General sales	1,170 90	
Sundry fees	100 00	
Miscellaneous fees	30 00	
Suspense account	12 00	
		1,312 90
Crown Timber—		
Timber dues	2,370 68	
Hay permits	36 75	
		2,407 43
Mining—		
Petroleum	113,443 40	
Registration fees	180 00	
Mining fees	1,408 00	
		115,031 40
General—		
Liquor permit fees	194 00	
Fines and forfeitures	222 00	
Trappers' licenses	1,599 00	
Traders' licenses	1,280 00	
		3,295 00
Grand total		**122,046 73**

DOMINION OBSERVATORY, OTTAWA

Work with the meridian circle was prosecuted on the same programme as in recent years, observations having been obtained on 139 nights. The observations for the present programme are now practically completed, with the exception of two or three months' work which can not be carried out till the coming autumn and winter.

Field observations for latitude and longitude were carried out at five stations in the Mackenzie basin. Since only one of these stations could be reached by telegraph the connection for longitude was made by wireless telegraphy. For this purpose the wireless time signals sent out from three United States stations were used, the signals being observed both at the field stations and at Ottawa; the longitudes are thus based strictly upon Ottawa, irrespective of the accuracy of the time signals employed. At the one station which could be reached by telegraph the longitude was determined both in the ordinary way and by wireless signals, the interagreement between the two methods being highly satisfactory. A publication has been issued containing the results of all latitude and longitude observations which have been carried out by the

Observatory up to the end of 1919, together with the solution and adjustment of the Canadian longitude net.

This observatory also co-operated in the Australian longitude campaign carried out by Adelaide Observatory, by receiving the wireless time signals sent for that purpose by Annapolis, Maryland, U.S.A., and Lafayette, France.

The time service has been maintained as in previous years, and the time system in the new Parliament Buildings has been connected with the observatory. Ten secondary master clocks are synchronized continuously; these in turn control over 550 clocks and dials of various kinds, including the tower clocks at the observatory and the city post office. Relays beating seconds are maintained in three offices in the city, one clock is synchronized every hour, time signals are sent out by telegraph and telephone, and the time is recorded on the various seismographs at the observatory.

A time comparison is made daily with Washington and Paris by means of the wireless time signals sent out by Annapolis and Lafayette. This is in co-operation with the International Time Commission in connection with an investigation of unexplained discrepancies in meridian observations. Experimental work has been continued in connection with the chronograph registration of wireless time signals, and a method of registration has been developed which is practically free from systematic error.

The 15-inch equatorial telescope has been utilized as heretofore for obtaining radial velocities of stars, a total of 942 spectograms having been made, with exposures varying from 30 to 70 minutes; 102 direct photographs (average exposure three hours) have also been obtained with the short focus camera attached to the equatorial. The work has largely been confined to the study of stars of the Beta Canis Majoris type; quite a large number of these have been discovered; several of them have been studied somewhat in detail and show very interesting peculiarities. Considerable experimental work has also been done with the 8-inch doublet camera in order to determine the light curves of some of the stars of this type at the same time as the radial velocity curves.

Three publications have been prepared during the course of the year, describing the investigations in progress.

The equatorial has been available to the public on Saturday nights, and this privilege has been taken advantage of by many visitors.

With the coelostat and solar spectograph, 304 plates comprising over 1,450 observations recording over 13,000 strips of solar, iodine, and electric arc spectra were secured. Also 52 photographs of the sun were taken with the coelostat camera to record sun-spots, and measurements of the spectograms have been carried on as usual. A first instalment (four sections) of "Spectroscopic Investigations of the Sun" (Volume VI of "Publications of the Dominion Observatory") has been prepared. Some results of the year's work may be mentioned: Discovery and elimination of an important error due to capillary lag in oil of micrometers; measurements of sunspot spectra support our pore theory of variation in solar wave-lengths, and this theory has been applied to cepheid variation; measurements of the solar rotation in 1915 were found to decline progressively from January to July—a change explained in terms of "blended spectrum." The new double spectrocomparator, designed in 1917, was satisfactorily finished in the observatory machine-shop. Vacuum arcs were designed in preparation for an extended programme of observation of arc and solar wave-lengths.

With the photographic equatorial telescope the observing programme has not been regularly carried out owing to lack of observers. Some work has been done on the reduction of previous observations, the magnitude scale derived being in good agreement with that of Professor Parkhurst. The thermopile equipment, consisting of thermopile, light-source, condensing lenses, and projection lenses, has been mounted and some experimental work has been done with it during the year.

The operations of the magnetic survey were carried out along the lines followed during previous years. Field observations for the magnetic elements were made at over fifty stations in southeastern Ontario, Quebec, and the Maritime Provinces. A publication has been issued giving the results of all our magnetic observations up to 1920, comprising about 500 magnetic stations from coast to coast, and containing the values of declination, inclination, and intensity, all reduced to epoch 1921, including a map showing graphically the declination at each of the magnetic stations.

Gravity work, which had been suspended for some years, owing to the lack of an observer, was resumed during the last season. The stations occupied, in addition to observations at Washington and Ottawa for standardization purposes, were the same as those occupied for latitude and longitude in the Mackenzie basin. Work of this kind, in this region, forms a marked addition to available data, on account of the far northern situation of the stations, very little work having been done in latitudes as high as this. Such work is also useful, in this particular region, in connection with the possibilities of the existence of oil and gas. A publication has been prepared covering this work as well as giving a reduction of all previous gravity work done in Canada.

During the year there were eighty-nine earthquakes registered at Ottawa, of which but a very small number—eighteen in all—admitted of a distance estimation; the season was remarkable for the small number of well-marked earthquakes. All the instruments were kept recording continuously, and in addition to the Bosch seismographs and the Wiechert vertical instrument, there was received and installed, as a north-south component, one of the Milne-Shaw seismographs on order. This instrument is now satisfactorily recording in the vault previously provided for its reception.

The series on the Location of Epicentres was continued, the locations for 1917-18-19 appearing in two publications.

Reports have been made monthly to 120 stations, the reports being issued as a rule between the first and the fifth of the month for the preceding month; reports from these stations have also been received here.

The seismographs at Halifax and Saskatoon have furnished us with their records for reading and the results have been published in our bulletins. The undagraph at Chebucto Head, Nova Scotia, has also furnished records of the wave counts which have been incorporated into our records here.

The observatory library at present contains nearly 11,000 bound books and pamphlets; the bindery has continued to be very useful in binding and numbering books and pamphlets, mounting maps, repairing books and other such work.

During the year there have been two international astronomical meetings, one at Middletown, Conn., the other at Toronto. At both of these meetings the Observatory was represented by the Director and several members of the staff: thirteen papers were presented, covering the various phases of observatory work.

Dominion Astrophysical Observatory, Victoria, British Columbia

This is the fourth annual report of the work of the Dominion Astrophysical Observatory in which actual observations commenced on May 6, 1918. The details of the work are presented in complete form in the publications of the observatory of which 11 numbers were published during the year, the total number to date being 31. It will be necessary here only to present a brief description of the work.

The observing weather during the past year has been poorer than even the previous year which itself was poorer than the two first years. In the year April 1, 1921, to March 31, 1922, 1,561 stellar spectra were photographed, between the numbers 5829 and 7389. The total number of nights the dome was opened and

observing started was 224. On 7 of these nights no successful observations were made and on 27 nights only one spectrogram was secured. On 97 nights the sky remained clear for a considerable part of the usable time, on the average about 60 per cent, and on 93 nights the sky was clear for the whole night. On the remaining 141 nights the sky was either wholly cloudy or so broken that no observations were attempted.

The first main programme of work of the observatory, the determination of the radial velocities of upwards of 700 stars from Boss' Preliminary General Catalogue was completed during the year and the results published in two numbers, Vol. II, No. 1, "The Radial Velocities of 394 Stars," and Vol. I, No. 26, "Eighty-eight Spectroscopic Binaries," Vol. I, No. 10, "One Hundred Spectroscopic Binaries," having appeared earlier. Observations and measurements for this major work were completed by July, the preparation of the manuscript for publication occupied about a month and it was finally received from the printers about the end of the calendar year. The main publication contains the velocities of 537 constant velocity stars, the velocities of the systems of 22 spectroscopic binaries and of 35 suspected binaries, a total of 594 stars. There were measured and reduced to obtain these velocities 4,970 stellar spectrograms and the magnitude of the work will be more easily understood when it is stated that the stars whose radial velocities had been previously determined at all other observatories over a time interval of twenty years are only about 2,000 in number. In the course of this work 188 spectroscopic binaries were discovered here as compared with about 600 discovered elsewhere.

A new observing programme comprising about 1,500 stars between 5.5 and 6.5 visual magnitude selected from Harvard 50 was prepared and observations of some of these stars were secured. It was, however, felt desirable, before actively undertaking a programme of this magnitude, to finish up some smaller pieces of work which had arisen in the course of the previous programme. The principal one is the determination of the absolute magnitude, and hence of the distance (spectroscopic parrallax it is generally termed), of the stars whose velocities had been determined here, and which are susceptible to treatment by this method, about 400 in number. This method depends upon estimates of the relative intensities of certain pairs of lines in the spectra of the stars and has been developd by Prof. Adams, of Mount Wilson. Spectra of a considerable number of additional stars to those already obtained are required for standardizing the method. It is of considerable magnitude and will take about another year for completion.

The director has prepared a programme of observation of all the Oe and Oe5 stars within reach at Victoria. Stars of this spectral type are relatively few in number, only about 30 in the northern sky, are the stars of highest temperature and are of special interest in the scheme of stellar evolution. Some progress has been made in the observation and measurement of these stars.

Considerable preliminary work has been done on the distribution of intensity in stellar spectra but this investigation is not yet far enough advanced to permit of any statement as to results. Most of the time after the completion of the first programme of radical velocities has been devoted to the observation and discussion of three O-type spectra. In these spectra the presence of the enhanced helium components to the Balmer lines, these components being intermediate members of the well known Pickering Series, has been conclusively demonstrated. These components previously found in the laboratory and now found in the stars give strong support to Bohr's theory of atomic structure. From the measured wave lengths of these stellar lines, independent values of the Rydberg and other atomic constants were obtained. These values are in excellent agreement with laboratory values and show that atomic structure and behaviour is similar in the stars and the laboratory. Other

deductions as to temperature and other physical conditions are being made and the whole work will appear as Vol. I, No. 30, of our publications.

In addition to these main investigations considerable additional time has been spent by the director on the determination of the spectroscopic orbits and dimensions of eclipsing variables and by other members of the staff on the orbits of spectroscopic binaries.

The telescope and spectrograph remain unchanged since last year's report and they have worked in the same satisfactory manner as heretofore.

During the year an ultra-violet spectrograph for use at the principal focus of the 72-inch telescope was obtained from Hilgar, London. This instrument was received about the new year and considerable of the director's time was spent in testing and adjusting it. Preliminary exposures to stars show very well defined and satisfactory spectra and the instrument should be especially useful in giving information about the little-known ultra-violet portion of stellar spectra.

The privilege extended to the public of viewing celestial objects through the telescope every Saturday evening has been continued and is much appreciated, the average number through the summer months being about 200 and even in the bad weather of the winter generally reaching 50.

Papers by various members of the staff have been read at scientific meetings during the year and many of these have appeared in scientific journals. These investigations have in general been published in detail in the Publications of the Dominion Astrophysical Observatory.

Natural Resources Intelligence

While the past year has been one of marked decline in prices—imposing a trying period upon almost every branch of basic industry—interest has not flagged regarding the natural resources of Canada as a field for development. More inquiries than usual concerning natural resources have been received from abroad, particularly from the United States.

Information Service.—During the year the Natural Resources Intelligence Branch received some 25,500 requests for information and, in response, issued to correspondents 66,700 maps and 157,000 reports and pamphlets. Roughly 8,800 publications were supplied to commercial firms, 8,500 to prospective land settlers, direct and about 84,000 to general applicants. The distribution by countries—37,700 copies to residents of the United States, 24,300 to correspondents in Great Britain, and 1,500 to individuals in other countries—denotes the widespread publicity obtained respecting Canadian resources. In the preparation of the material required to conduct this intelligence service generous aid was received from federal and provincial departments and 136,000 copies of publications were supplied to such departments for their own use or for further distribution. Several sets of slides with accompanying lectures on Canadian life and resources were sent to Great Britain, Newfoundland, Australia, New Zealand, and the United States for use by officials or by publicity agencies. In addition, a circulating lantern-set library for the use of public lecturers, schools, community clubs, etc., has been widely used, especially in Ontario. Branches of the departments of education in Saskatchewan and Alberta have acted as agents for this service in their respective provinces.

Unoccupied and Uncultivated Lands.—Intermingled with the settled agricultural lands of the Dominion are large areas of vacant lands, notably in the Prairie Provinces. As it is generally realized that the total acreage of such lands is very great and that the problem of their early settlement is of first importance, steps have been taken to provide effective machinery for placing the land-seeker in touch with owners of unoccupied areas. Investigations have been carried out by the Department

through its Natural Resources Intelligence Branch, and lists of vacant lands have been published giving information as to their area, nature of soil, improvements, prices and terms of sale or lease, and the owners' names and addresses. Maps have also been issued showing the exact location of such lands in western Canada. To date these investigations have covered Manitoba, Saskatchewan, Alberta, Nova Scotia, New Brunswick, and Prince Edward Island. A new survey is now being made of the situation in the Prairie Provinces and revised lists, bringing the information up to date, are being prepared.

Three statements dealing with the land situation in Western Canada follow.

DETAILED STATEMENT of Surveyed Areas in Manitoba, Saskatchewan and Alberta January 1, 1922

	Manitoba	Saskatchewan	Alberta	Total
	Acres	Acres	Acres	Acres
Area under homestead including military homesteads	8,404,800	27,634,300	18,300,000	54,339,100
Area under pre-emption, purchased homesteads sales, Half-Breed scrip, bounty grants, special grants, etc	5,108,200	7,762,900	3,895,100	16,766,200
Area granted to railway companies	3,566,997	15,177,063	13,120,014	31,864,074
Area granted to Hudson's Bay Company	1,196,700	3,183,600	2,175,700	6,556,000
Area of School Land Endowment (1-18 of area surveyed in sections)	1,637,300	3,942,000	3,755,700	9,335,000
Area sold subject to reclamation by drainage		267	32,505	32,772
Area sold under irrigation system		76,832	980,850	1,057,682
*Area under timber berths	908,200	785,600	1,293,900	2,987,700
*Area under grazing leases	132,600	3,069,500	2,933,400	6,135,500
*Area of forest reserves and parks	2,386,700	5,953,700	16,754,000	25,094,400
*Area reserved for forestry purposes (inside surveyed tract)	746,300	1,430,000	1,677,500	3,853,800
*Area of road allowances	976,900	1,467,500	1,287,200	3,731,600
Area of parish and river lots	505,211	84,010	118,564	707,785
Area of Indian Reserves	433,860	1,071,109	1,367,974	2,872,943
Area of Indian Reserves surrendered	87,560	410,297	302,228	800,085
*Area of water-covered lands (inside surveyed tract)	4,260,400	1,911,200	2,302,200	8,473,800
Area now available for entry	5,348,300	5,068,000	15,460,100	25,896,400
Total surveyed area	35,700,028	79,027,878	85,756,935	200,484,841

*Area not available for cultivation.

The Land Situation—Manitoba, Saskatchewan, and Alberta corrected to 1st January, 1922

	Manitoba	Saskatchewan	Alberta	Total for all three provinces
	Acres	Acres	Acres	Acres
Surveyed area—				
Land	31,439,628	77,116,678	83,454,735	192,011,041
Water	4,260,400	1,911,200	2,302,200	8,473,800
Total	**35,700,028**	**79,027,878**	**85,756,935**	**200,484,841**
Unsurveyed area—				
Land	112,131,070	75,223,642	75,423,925	262,778,637
Water	13,341,200	6,836,480	2,201,540	22,379,220
Total	**125,472,270**	**82,060,122**	**77,625,465**	**285,157,857**
Total area—				
Land	143,570,698	152,340,320	158,878,660	454,789,678
Water	17,601,600	8,747,680	4,503,740	30,853,020
Grand total	**161,172,298**	**161,088,000**	**163,382,400**	**485,642,698**

STATEMENT of Land Sales by Railway Companies having

Year	Hudson's Bay Company		Canadian Pacific Railway Company		Manitoba South-western Colonization Railway Company		Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Company	
	Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount
		$		$		$		$
1893			93,184	295,288	14,164	57,559	1,603	
1894	7,526	48,225	43,155	131,628	6,312	280,003	640	
1895	4,431	23,209	55,453	176,950	5,623	22,330	2,391	
1896	9,299	52,410	66,624	220,360	21,254	88,568	286	
1897	10,784	53,277	135,681	431,095	63,800	634,644	2,524	
1898	62,000	310,000	242,135	757,792	106,473	363,982	22,534	
1899	56,875	274,625	261,832	814,857	58,019	199,558	61,030	178,517
1900	70,196	352,631	379,091	1,152,836	133,507	437,449	18,932	53,974
1901	82,308	399,804	339,985	1,046,665	59,749	214,953	22,266	74,810
1902	269,577	1,412,332	1,362,478	4,440,500	206,411	713,365	39,835	147,365
1903	330,046	1,939,804	2,260,722	8,472,250	250,372	699,210	843,900	1,476,900
1904	144,857	879,910	857,474	3,516,864	29,522	113,303		
1905	139,721	865,905	411,451	2,045,800	80,342	296,936		
1906	236,191	1,863,375	1,012,322	6,015,060	83,418	360,889		
1907 (9 months to March 31)	69,158	742,221	851,083	4,817,682	3,051	22,645	1,353	16,789
1908	21,184	267,215	81,060	727,367	31,982	153,007	5,621	68,869
1909	25,449	288,836	29,331	383,390	10,396	84,845	37,662	380,371
1910	104,382	1,297,454	655,585	10,473,425	14,501	126,950	106,000	964,600
1911	267,038	3,747,768	715,095	10,372,661	20,313	284,859	113,533	1,237,204
1912	42,554	808,943	855,280	12,420,488	18,932	117,497	35,213	495,116
1913	53,581	1,128,806	447,158	6,348,352	2,768	48,639	15,395	255,399
1914	26,292	572,837	263,962	4,242,089	7,626	91,948	1,629	21,546
1915	16,400	306,550	151,262	2,496,872	489	5,508	1,292	19,118
1916	79,310	1,273,144	242,215	3,670,421	4,780	58,808	12,246	180,361
1917	254,941	4,234,244	405,764	6,612,040	12,470	165,245	21,533	331,596
1918	386,394	6,914,947	545,285	11,044,883	25,933	321,005	49,723	783,062
1919	285,561	4,978,950	602,555	10,580,669	5,289	67,214	33,838	527,670
1920	276,629	4,724,941	571,571	11,356,146	4,623	56,760	32,095	474,895
1921	178,301	3,037,369	275,636	5,898,994	1,518	20,058	11,432	160,472
1922	33,595	545,611	101,497	1,732,350	1,519	15,497	1,274	22,315
Total	3,544,580	43,345,343	14,315,926	132,695,724	1,285,156	5,471,134	1,495,780	7,870,949

Government Land Grants, and by the Hudson's Bay Company.

Calgary and Edmonton Railway Company		Canadian Northern Railway Company		Great Northwest Central Railway Company		Total		Average per acre
Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount	
	$		$		$		$	$ c
11,260						120,211	352,847	2 93
11,035						68,668	207,856	3 02
46,815						114,713	222,489	1 94
16,553						108,016	361,338	3 34
9,436						222,225	719,016	3 23
15,481						448,623	1,431,774	3 18
24,738	53,335					462,494	1,520,792	3 28
46,653	128,256					648,379	2,125,146	3 27
116,719	352,037					621,027	2,088,269	3 36
323,494	1,033,396					2,201,795	7,746,958	3 56
231,800	909,600	183,736	631,502	128,435	522,490	4,229,011	14,651,757	3 46
129,007	563,507	64,469	313,575	41,858	177,081	1,267,187	5,564,240	4 39
109,191	512,898	231,707	1,221,469	17,593	103,564	990,005	5,046,572	5 09
85,784	480,066	204,966	1,014,351	20,003	137,503	1,642,684	9,871,241	6 01
39,515	346,064	289,576	1,711,109	4,023	41,470	1,237,759	7,697,930	6 02
8,606	75,644	196,946	1,746,504	1,294	13,855	346,693	3,052,461	8 80
6,370	66,508			165	7,935	109,373	2,211,885	11 08
18,323	182,926	285,428	2,783,010	571	6,863	1,184,790	15,835,228	13 36
11,820	116,231	277,414	3,336,797	1,438	27,417	1,406,651	19,122,937	13 59
10,853	154,424	365,926	4,216,578	632	11,373	1,329,390	18,224,419	13 70
4,155	44,212	182,491	2,009,642	1,601	32,105	707,149	9,867,155	13 95
19,575	460,129	182,491	2,009,642			501,575	7,398,191	14 75
23,042	444,018			316	6,956	192,801	3,279,031	17 01
11,689	172,033			4,646	81,182	354,886	5,435,949	15 32
33,821	573,875	17,796	298,938	8,829	141,439	755,154	12,357,377	16 35
53,335	815,628	39,546	732,351	16,021	275,724	1,116,237	20,887,600	18 71
31,774	479,496	65,110	1,261,963	14,530	252,774	1,038,657	18,148,736	17 47
26,953	425,656	86,305	1,685,241	27,981	464,586	1,026,157	19,188,225	18 69
11,681	191,928	69,934	1,455,319	5,128	96,616	553,630	10,860,756	19 61
3,024	51,603	14,163	263,199	167	2,997	155,239	2,833,572	16 96
1,500,502	8,633,467	2,758,004	26,691,191	295,231	2,403,939	25,201,179	227,111,747	9 01

ACCOUNTS

STATEMENT of Gross Cash Receipts from all Sources, During the Fiscal Year ended March 31, 1922, Compared with Receipts for the Previous Fiscal Year.

Source of Revenue	1921-22	1920-21	Increase	Decrease	Net Decrease
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Dominion lands	2,918,529 59	4,086,076 49		1,167,546 90	
School lands	2,335,726 83	4,480,270 67		2,144,543 84	
Ordnance lands	8,446 48	8,887 88		441 40	
Seed grain and relief	372,350 89	773,200 67		400,849 78	
Casual revenue	20,128 63	811,970 45		791,841 82	
Registration fees—Yukon	524 64	448 31	76 33		
Fines and forfeitures	2,912 73	1,139 75	1,772 98		
Sales of railway lands—Special account	8,800 00	27,602 30		18,802 30	
	5,667,419 79	10,189,596 52	1,849 31	4,524,026 04	4,522,176 73

STATEMENT of Cash Receipts on Account of Dominion Lands Revenue for the Fiscal Year Ended March 31, 1922, as Compared with the Receipts for the Previous Fiscal Year.

Particulars	1921–22	1920–21	Increase	Decrease	Net Decrease
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Homestead fees	73,540 00	53,880 00	19,660 00		
Sale fees	170 00	50 00	120 00		
Improvements	55,168 13	69,732 66		14,564 53	
Pre-emption sales under 1908 Act	660,501 11	1,484,277 49		823,776 38	
Purchased homestead sales	36,200 35	93,571 24		57,370 89	
General sales	52,178 91	135,749 20		83,570 29	
Map sales, office fees, etc	23,352 07	16,333 67	7,018 40		
Rentals of land	10,924 49	12,029 05		1,104 56	
Survey fees		31 65		31 65	
D.L.S. Examination fees	170 00	200 00		30 00	
Patent and interchange fees	470 00	320 00	150 00		
Suspense account	10,294 23	3,400 79	6,893 44		
Interim receipt account Yukon	61 00	578 15		517 15	
Miscellaneous	5,006 18	11,212 29		6,206 11	
Timber dues	683,490 99	705,313 77		21,822 78	
Grazing rental	144,344 67	183,756 97		39,412 30	
Grazing lands improvements	916 70	760 00	156 70		
Hay permits	24,398 99	30,217 62		5,818 63	
Irrigation fees	436 00	399 00	37 00		
Irrigation sales	12,969 52	7,573 68	5,395 84		
Sale of trees, etc.—Forestry Branch	2,843 75	7,269 12		4,425 37	
Fishing permits—Forestry Branch	1,420 00	1,660 00		240 00	
Coal lands	413,913 67	457,065 08		43,151 41	
Mining fees	88,962 73	65,824 73	23,138 00		
Dredging leases	2,538 30	1,443 22	1,095 08		
Hydraulic leases	2,569 00	2,160 00	409 00		
Potash leases	1,553 75	893 80	659 95		
Petroleum leases	488,359 75	620,872 62		132,512 87	
Export tax on gold	30,774 68	31,126 21		351 53	
Free certificates for export of gold	4 50	1 50	3 00		
Stone quarries	7,527 23	9,842 92		2,315 69	
Sand, stone and gravel	1,363 75	2,537 74		1,173 99	
Rent of water-power	3,429 56	3,244 93	184 63		
Amber leases	238 00		238 00		
Quartz rental	1,061 90		1,061 90		
Rocky Mountains park	59,208 63	60,961 23		1,752 60	
Jasper park	7,973 01	5,473 12	2,499 89		
Waterton Lakes park	3,148 12	2,896 13	251 99		
Yoho park	1,544 12	1,206 09	338 03		
Antelope park	1,015 20	409 60	605 60		
Buffalo park	226 85	124 15	102 70		
Elk Island park	80 00	31 50	48 50		
Fort Anne park	45 00	38 00	7 00		
Glacier park	285 38	230 82	54 56		
Moose Mountain buffalo reserve	452 60	35 60	417 00		
Point Pelee park	21 02	1,341 15		1,320 13	
Isle-aux-Noix reserve	215 00		215 00		
Kootenay park	8 75		8 75		
Liquor permits N.W.T.	194 00		194 00		
Traders licenses N.W.T.	1,280 00		1,280 00		
Trappers licenses N.W.T.	1,599 00		1,599 00		
Taxidermist licenses	79 00		79 00		
	2,918,529 59	4,086,076 49	73,921 96	1,241,468 86	1,167,546 90
Refunds	119,079 58	130,750 93		11,671 35	11,671 35
	2,799,450 01	3,955,325 56	73,921 96	1,229,797 51	1,155,875 55

In addition to $52,178.91 on account of general sales, the department received $8,800 from sales of railway lands, which sum as provided by Orders in Council, has been credited to special accounts in the books of the Finance Department.

STATEMENT Showing Receipts on account of Dominion Lands from July 1, 1872, to March 31, 1922

Fiscal Year	Homestead Fees	Pre-emption Fees	Improvements	Sales		Map sales, Office and Registration Fees, etc.	Dominion Lands Surveyors' Examination Fees	Rents, Survey Fees, Miscellaneous, and Suspense Account	Purchased Homestead Inspection, Cancellation and Sundry Fees	Timber Dues
				Cash	Scrip					
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1872-73	6,960 00			19,170 20						109 25
1873-74	7,310 00			19,834 75				125 50		2,710 55
1874-75	11,510 00			13,666 90		129 00				2,335 25
1875-76	4,680 00			3,478 91	320 00	..				387 00
1876-77	2,250 00			1,085 86	136,955 16	4 00		100 00	40 00	320 00
1877-78	14,540 00			2,794 86	120,159 54	..	180 00		290 00	1,620 00
1878-79	17,690 00			4,998 39	210,904 84	81 00	310 00	13 70	410 00	325 00
1879-80	11,255 00	10,241 43		45,708 97	81,685 86	245 40	580 00	183 25	1,780 00	25,121 16
1880-81	20,450 00	10,801 75	269 00	71,170 17	70,828 30	985 40	420 00	37 58		32,028 34
1881-82	54,155 00	39,843 90	1,758 00	1,240,328 27	50,590 84	3,036 45	890 00	58 10		58,753 14
1882-83	73,015 00	54,725 00	7,114 91	516,092 21	33,638 40	3,109 50	890 00	501 77		90,066 46
1883-84	41,580 00	28,810 00	2,596 11	424,863 36	40,919 67	1,289 55	530 00	45,766 53	1,713 45	147,983 10
1884-85	25,645 00	17,100 00	2,328 75	199,275 32	45,875 60	1,621 82	370 00	50,068 57	2,685 00	87,474 99
1885-86	26,110 00	14,371 00	1,101 50	76,140 41	214,657 97	1,339 34	360 00	20,070 00	5,025 00	64,820 31
1886-87	19,614 00	6,887 93	1,971 55	48,175 76	337,640 19	1,171 39	240 00	44,561 00	7,778 40	65,111 74
1887-88	23,691 00	4,830 00	1,918 35	52,238 36	313,522 67	1,660 75	240 00	20,591 41	12,078 53	94,964 55
1888-89	39,160 00	10,550 00	4,128 48	57,513 16	318,238 57	1,410 16	220 00	10,389 57	20,402 50	90,290 00
1889-90	35,920 00	8,580 00	3,250 54	54,896 85	228,744 47	2,099 07	190 00	3,316 23	21,715 00	84,642 95
1890-91	29,164 10		6,302 61	91,664 98	171,425 14	1,854 78	88 00	7,951 05	16,790 00	102,902 71
1891-92	46,994 00		6,472 31	111,651 01	97,822 41	2,147 31	135 00	29,898 49	27,964 00	106,461 35
1892-93	37,689 74		7,113 50	96,171 67	77,231 18	975 20	82 00	18,509 35	22,015 50	105,865 24
1893-94	36,462 26		3,497 76	53,254 71	27,840 96	973 11		13,457 09	11,097 00	81,290 51
1894-95	29,664 88		3,567 90	37,293 71	23,269 62	695 99	10 00	6,271 77	6,566 90	74,079 20
1895-96	18,278 00		3,163 15	46,373 98	46,929 65	610 78	50 00	21,679 31	6,810 50	61,923 47
1896-97	21,179 00		3,737 01	49,335 53	16,929 38	795 05	70 00	16,115 98	8,527 50	68,992 82
1897-98	34,780 00		5,619 63	80,178 64	28,918 14	1,987 40	10 00	14,436 53	15,859 88	119,313 78
1898-99	58,235 00		4,297 62	116,598 35	21,307 58	1,266 05	20 00	69,017 88	20,820 40	155,350 63
1899-1900	72,690 00		4,835 81	103,247 58	88,756 22	1,258 85	190 00	31,154 04	21,688 00	126,345 82
1900-01	79,910 00		5,213 22	40,360 93	326,270 03	3,874 14	165 00	71,966 23	12,874 00	209,399 32
1901-02	144,425 00		8,481 46	66,950 21	169,767 13	5,792 96	370 00	71,973 20	663 00	207,790 90
1902-03	320,409 65		11,829 08	155,537 49	158,452 66	5,911 96	365 00	125,128 66	595 00	470,916 93
1903-04	255,772 36		15,119 47	196,750 15	189,705 08	5,549 13	463 50	81,246 46	1,081 00	397,344 33
1904-05	304,806 25		21,571 25	154,128 04	19,644 59	4,879 13	906 50	144,854 31	1,271 00	266,951 16
1905-06	417,834 25		31,795 19	442,588 69	7,654 57	6,042 34	471 00	141,315 30	1,046 25	292,684 53
1906-07 (9 months)	215,119 55		39,763 63	503,202 44	11,349 89	5,449 06	420 00	60,450 99	685 00	379,476 32
1907-08	301,693 73		71,139 47	656,303 03	92,311 24	7,727 29	690 00	148,911 00	1,283 50	473,608 24
1908-09	389,039 00	141,550 15	70,928 86	951,442 28	20,136 27	7,296 55	1,040 00	75,596 95	9,579 50	269,857 32
1909-10	415,232 00	174,250 00	105,009 07	1,239,037 33	9,973 84	9,135 19	1,500 00	100,257 89	14,028 30	378,040 70

1910 11	445,135 00	156,485 00	143,227 13	1,193,756 04	1,437 84	8,730 01	1,310 00	42,111 92	20,142 85	387,054 96
1911 12	391,703 12	102,070 00	184,825 92	1,967,182 85	3,256 99	11,239 14	1,400 00	44,167 03	14,745 50	400,668 61
1912 13	337,055 00	85,940 00	168,904 42	1,650,491 87	6,157 27	14,483 91	1,040 00	17,866 65	11,380 00	463,738 75
1913 14	317,412 00	61,660 00	187,052 46	1,303,587 54	240 00	16,056 07	1,350 00	40,148 65	8,402 00	378,365 33
1914 15	238,295 00	28,720 00	114,982 17	696,672 23	80 00	14,290 23	970 60	33,234 14	4,776 10	310,934 29
1915 16	170,350 00	22,760 00	112,782 70	1,090,842 36		11,485 83	470 00	19,495 98	3,475 00	378,960 68
1916 17	112,110 20	14,690 00	112,711 33	2,707,203 99	332 61	13,976 95	560 00	21,212 91	2,910 00	429,403 09
1917 18	83,180 00	7,870 00	89,371 59	3,046,091 55	131 47	12,066 22	250 00	26,513 84	2,200 00	482,006 25
1918 19	42,190 00	..	49,225 97	2,192,860 81	323 41	*11,039 54	100 00	77,291 91	360 00	408,728 28
1919 20 ..	67,460 00		78,913 74	2,799,605 09	80 00	17,134 19	255 00	28,535 19	340 00	589,780 21
1920 21	53,880 00		70,492 66	1,721,171 61		16,333 67	200 00	23,149 23	370 00	705,313 77
1921 22 .	73,540 00		56,084 83	761,849 89		23,352 07	170 00	29,378 90	640 00	683,490 99
Totals .	6,027,854 09	1,002,736 16	1,824,500 11	29,174 819 32	3,822,417 25	262,593 23	20,574 60	1,849,125 05	344,905 56	10,816,065 78

STATEMENT Showing Receipts on Account of Dominion Lands from July 1, 1872, to March 31, 1922—*Concluded.*

Fiscal Year	Grazing Lands		Hay, Coal, Mining Fees, Stone Quarries, Export Tax on Gold, etc.		Canadian National Parks	Colonization Lands		Gross Revenue	Refunds	Net Revenue
	Cash	Scrip	Cash	Scrip		Cash	Scrip			
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1872-73								26,239 45		26,239 45
1873-74								29,980 80		29,980 80
1874-75								27,641 15		27,641 15
1875-76								8,865 94		8,865 94
1876-77								140,755 02		140,755 02
1877-78								139,584 40		139,584 40
1878-79								234,732 93		234,732 93
1879 80								206,801 37	4,636 08	202,165 29
1880-81								206,990 54	5,038 22	201,952 32
1881-82	2,245 00		40 00			354,036 17		1,805,734 87	10,687 55	1,795,047 32
1882-83	22,844 43		913 91			248,492 01		1,051,403 60	8,746 05	1,042,657 55
1883-84	11,370 60		640 90			253,713 40		1,001,776 67	9,220 50	992,556 17
1884 85	17,089 75		815 63			1,214 22		451,564 65	12,070 85	439,493 80
1885-86	29,562 51	3,131 08	1,284 83					457,973 95	63,389 12	394,584 83
1886-87	14,242 77	39,487 67	1,570 40	80 00				588,532 80	19,543 16	568,989 64
1887-88	5,922 47	23,023 28	2,273 73	80 00	2,951 58		10,000 00	569,986 68	6,277 66	563,709 02
1888-89	2,207 69	16,802 63	3,946 55		2,528 73		16,000 00	594,088 04	5,226 23	588,861 81
1889-90	1,305 57	9,021 63	9,242 08		1,094 37			464,018 76	8,209 74	455,809 02
1890-91	3,079 55	16,193 77	8,628 44	160 00	2,397 35	5 28	4,460 50	463,068 26	7,195 27	455,872 99
1891-92	3,726 80	17,222 60	5,616 85		3,648 45			459,760 58	15,291 39	444,469 19
1892-93	6,380 80	11,542 39	6,266 13		4,983 23			394,825 93	18,314 97	376,510 96
1893-94	5,740 79	7,687 86	6,243 15		2,523 92			250,069 12	4,544 01	245,525 11
1894-95	5,353 72	8,628 00	5,229 54		2,321 87			202,983 10	4,365 99	198,617 11
1895-96	7,071 86	6,255 90	5,813 51		2,734 82			227,694 93	8,368 79	219,326 14
1896-97	4,715 01	2,500 00	11,794 18		2,132 11			206,853 57	15,010 54	191,843 03
1897-98	4,728 58	510 39	700,323 01		3,045 65			1,009,741 63	4,678 55	1,005,063 08
1898-99	5,245 88		1,129,164 77		2,994 16			1,584,328 32	32,296 39	1,552,031 93
1899-1900	8,382 86	4,083 30	1,038,362 92	20 00	2,727 60			1,503,743 00	23,062 28	1,480,680 72
1900-01	4,726 28	14,671 99	1,100,660 64	20 00	4,047 31			1,874,159 09	18,368 85	1,855,790 24
1901-02	7,292 46	8,409 27	737,902 53		*2,861 13			1,432,679 25	27,165 55	1,405,513 70
1902-03	13,913 33	15,041 33	607,722 05		*5,063 69			1,890,886 83	21,519 84	1,869,366 99
1903-04	19,790 27	13,921 29	495,883 18		*9,198 48			1,681,824 70	36,721 48	1,645,102 95
1904-05	36,145 32	5,237 36	364,927 59		*14,059 55			1,339,382 35	25,786 90	1,313,595 45
1905-06	51,583 89	80 00	297,302 44		18,883 83			1,709,315 28	33,418 36	1,675,896 92
1906-07 (9 months)	43,711 91	400 00	214,257 10		*15,887 42			1,490,503 31	35,117 75	1,455,385 83
1907-08	43,211 78	4,048 01	266,415 31		27,232 87			2,094,579 17	115,080 04	1,979,499 13
1908-09	53,312 79	3,257 84	253,339 17		31,321 20			2,277,678 09	102,463 78	2,175,214 31
1909-10	67,434 29	5,081 47	460,231 39		43,264 36			3,022,446 13	121,431 15	2,901,014 98
1910-11	60,702 80	2,356 00	774,569 27		69,054 59			3,306,073 41	198,689 47	3,107,383 94
1911-12	69,519 41	1,520 00	729,240 42		56,497 74			3,978,036 73	197,631 35	3,780,405 38

1912 13	79,412 76		779,695 53	1,587 32	37,448 72			3,655,202 20	246,105 26	3,409,096 94
1913–14	84,926 15	320 00	865 499 12		48,800 33			3,313,819 65	277,309 33	3,036,510 32
1914 15	101,710 58	400 00	1,594,905 42		37,895 97			3,177,866 73	317,764 75	2,860,101 98
1915–16	118,955 02	160 00	476,408 82		37,493 53			2,443,639 92	143,942 57	2,299,697 35
1916 17	128,341 50		600,934 13		45,851 45			4,190,238 16	134,243 14	4,055,995 02
1917 18	125,300 69	240 00	630,427 95		52,160 52			4,557,810 08	113,680 44	4,444,129 64
1918 19	148,179 55		630,975 74		55,006 72			3,616,281 93	76,031 02	3,540,250 91
1919 20	183,661 96		896,413 40		76,742 07			4,738,920 85	116,249 03	4,622,671 82
1920–21	183,756 97		1,234,558 49		76,850 09			4,086,076 49	130,750 93	3,955,325 56
1921 22	144,344 67		1,071,395 56		74,302 68			2,918,529 59	119,079 58	2,799,450 01
Totals.	1,931,151 02	241,235 06	18,021,835 78	1,947 32	876,008 09	857,461 08	30,460 50	77,105,690 00	2,894,723 91	74,210,966 09

* Including scrip.

STATEMENT Showing Yearly the Gross Revenue (in cash only) Received from all sources from July 1, 1902, to March 31, 1922.

Fiscal Year	Dominion Lands	School Lands	Seed Grain	Ordnance Lands	Fines and Forfeitures	Registration Fees	Casual Revenue	Chinese Immigration Revenue	Total
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1902 03	1,716,597 20	392,206 93	28,789 97	17,612 79	5,220 88	81,404 18	2,230 26		2,244,061 21
1903-04	1,478,106 33	233,769 62	26,122 30	30,494 34	5,911 92	109,233 73	3,402 94		1,887,041 18
1904 05	1,314,485 40	332,914 48	16,471 34	10,346 90	10,018 49	123,082 86	4,258 14		1,811,577 61
1905 06	1,701,580 71	608,960 79	12,577 29	10,893 17	3,304 77	180,310 73	8,496 09		2,526,123 55
1906 07 (9 months)	1,478,749 51	724,353 73	10,850 06	6,663 90	21 00	46,124 20	11,785 81		2,278,548 21
1907-08	1,998,219 92	708 045 83	12,899 84	8,674 95	1,650 00	2,256 65	20,069 03		2,751,816 22
1908-09	2,254,283 98	687,422 74	53,590 86	205,749 96	281 00	1,352 13	26,224 29		3,228,904 96
1909-10	3,007,390 82	1,292,259 95	175,152 72	189,902 48	211 00	1,471 49	42,625 96		4,709,014 42
1910 11	3,302,279 57	1,614,733 93	153,351 14	6,009 34	4,052 22	1,378 19	11,336 06		5,093,140 45
1911 12	3,973,259 74	1,594,533 96	119,634 13	11,566 46	10,510 48	1,066 05	32,824 65	971,339 00	6,714,734 47
	22,224,953 18	8,189,201 96	609,439 65	497,914 29	41,181 76	547,680 21	163,253 23	971 339 00	33,244,963 28
1912 13	3,647,457 61	1,621,508 11	171,342 87	60,607 80	7,150 35	1 241 25	22,873 55	3,549,242 00	9,081,423 54
1913 14	3,313,259 65	1,215,822 37	176,736 89	5,805 98	7,888 50	966 50	27,884 47	2 644,593 00	7,392,957 36
1914-15	3,177,386 73	943,717 00	68,263 56	4,446 64	5,828 00	969 85	11,738 10	588,124 00	4,800,443 88
1915-16	2,443,479 92	934,965 37	2,525,528 50	5,997 98	3,075 21	908 15	28,002 62	19,389 00	5,961,346 75
1916-17	4,189,905 55	1,699,370 06	3,652,729 05	5,553 26	2,184 72	796 85	15,618 26	140,487 00	9,706,644 75
1917 18	4,557,438 61	2,836,216 40	2,613,708 67	7,929 75	3,686 00	562 25	9,074 15	336,757 00	10 365,372 83
1918-19	3,615,958 52	5,087,875 81	1,378,275 76	4,819 27	35 00	789 22	12,381 71		10,100,135 29
1919-20	4,738,840 85	3,900,091 75	1,155,354 64	9,840 33	70 00	430 78	22,837 87		9,827,466 22
1920-21	4,086,076 49	4,480,270 67	773,200 67	8,887 88	1,139 75	448 31	811,970 45		10,161,994 22
1921 22	2,918,529 59	2,335,726 83	372,350 89	8,446 48	2,912 73	524 64	20,128 63		5,658,619 79
	36,688,333 52	25,055,564 37	12,887,491 50	122,305 37	33,970 26	7,637 80	982,509 81	7,278,592 00	83,056,404 63
Increase	14,463,380 34	16,866,362 41	12,278,051 85				819,256 58	6,307,253 00	49,811,441 35
Decrease				375,608 92	7,211 50	540,042 41			

SESSIONAL PAPER No. 12

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1922, as Compared with the Previous Year.

Particulars	Fiscal Year 1921-22	Fiscal Year 1920-21	Increase	Decrease	Net Increase
Rocky Mountains Park	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Rent	9,497 21	11,784 15		2,286 94	
Sulphur water rates	910 50	801 38	109 12		
Timber dues	654 55	1,131 98		477 43	
Cold water rates	8,204 62	8,580 08		375 46	
Sewer rates	2,961 92	3,065 21		103 29	
Transfer fees	208 00	207 00	1 00		
Cave and basin bathing tickets	10,403 35	10,578 20		174 85	
Livery licenses	844 00	307 00	537 00		
Pool, billiard and bowling licenses	236 00	260 00		24 00	
Boat licenses	102 50	103 00		0 50	
Barber licenses	70 00	90 00		20 00	
Grazing rental	755 00	521 00	234 00		
Hot Springs bathing tickets	5,831 55	6,886 35		1,054 80	
Telephone rent	5,166 53	4,044 74	1,121 79		
Fines		896 00		896 00	
Peddlers' licenses	144 00	70 00	74 00		
Guides' licenses	60 00	67 50		7 50	
Camping permits	360 00	233 00	127 00		
Cemetery lots	92 00	43 00	49 00		
Tea room licenses	60 00	220 00		160 00	
Sand and gravel	48 85	20 25	28 60		
Dog licenses	506 00	357 00	149 00		
Automobile licenses	6,431 00	5,887 00	544 00		
Scales	32 50	32 00	0 50		
Ice	16 25	6 25	10 00		
Sale of hay	16 00	15 25	0 75		
Theatre licenses	35 00	22 00	13 00		
Building permits	51 00	54 00		3 00	
Garden and dairy licenses	17 00		17 00		
Gum machines	20 00	48 00		28 00	
Golf coupons	3,471 50	3,643 00		171 50	
Miscellaneous	59 80	735 34		675 54	
Hay dues		0 55		0 55	
Chauffeurs' licenses	27 00	171 00		144 00	
Restaurant licenses	1,270 00	80 00	1,190 00		
Electricians licenses	9 00		9 00		
Stone quarries	1 00		1 00		
Improvements	635 00		635 00		Decrease
	59,208 63	60,961 23	4,850 76	6,603 36	1,752 60
Waterton Lakes Park					
Rent	801 82	371 73	430 09		
Camping permits	253 00	170 00	83 00		
Timber dues	129 05	110 00	19 05		
Fines	37 00	38 00		1 00	
Guides' licenses		10 00		10 00	
Grazing rental	1,763 00	1,912 00		149 00	
Hay dues	2 50	4 00		1 50	
Drivers' and livery licenses		44 00		44 00	
Boat licenses	74 00	68 00	6 00		
Transfer fees		10 00		10 00	
Building permits	7 00	4 00	3 00		
Tea room licenses		10 00		10 00	
Theatre license	10 00		10 00		
Dog licenses	3 00	9 00		6 00	
Restaurant licenses	30 00	10 00	20 00		
Impounding cattle	34 75	125 40		91 65	
Peddlers' licenses	4 00		4 00		
	3,148 12	2,896 13	575 14	323 15	251 99

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1922, as Compared with the Previous Year—*Continued*

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1921-22	1920-21			
Jasper Park	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Rent	2,144 79	3,018 23		873 44	
Timber dues	4,342 72	84 33	4,258 39		
Building permits	76 00	35 00	41 00		
Boat licenses	5 00	20 00		15 00	
Hay dues	3 60	5 70		2 10	
Peddler's licenses	46 00	34 00	12 00		
Fines		192 00		192 00	
Grazing rental	255 00	368 00		113 00	
Guides' licenses	47 50	54 40		6 90	
Drivers' and livery licenses	166 00	313 00		147 00	
Camping permits	92 00	26 00	66 00		
Pool, billiard and bowling licenses	170 00	210 00		40 00	
Dog licenses	189 00	208 00		19 00	
Restaurant licenses	90 00	120 00		30 00	
Butcher licenses	30 00	50 00		20 00	
Telephone rent	30 00	55 00		25 00	
Cold water rates	48 00	33 00	15 00		
Miscellaneous	83 95	109 76		25 81	
Theatre licenses	22 00	33 00		11 00	
Transfer fees	31 00	12 00	19 00		
Sand	6 00	8 70		2 70	
Cemetery lots	18 00	33 00		15 00	
Coal leases		282 00		282 00	
Chauffeurs' licenses	10 00	1 00	9 00		
Garden and dairy licenses	4 00	80 00		76 00	
Auto permits	45 00	50 00		5 00	
Cat taxes	12 00	37 00		25 00	
Ice	5 00		5 00		
Impounding fees	0 45		0 45		
	7,973 01	5,473 12	4,425 84	1,925 95	2,499 89
Yoho Park					
Timber dues	319 92	172 50	147 42		
Rent	530 20	517 39	12 81		
Transfer fees	20 00	8 00	12 00		
Camping permits	13 00	24 00		11 00	
Cemetery lots		3 00		3 00	
Grazing rental	70 00	52 00	18 00		
Fines		5 00		5 00	
Guides' licenses	25 00	15 00	10 00		
Miscellaneous	2 00	1 20	0 80		
Pool, billiards and bowling licenses	30 00	30 00			
Restaurant licenses	50 00	30 00	20 00		
Butchers' licenses	10 00	10 00			
Dog licenses	116 00	126 00		10 00	
Boat licenses	12 00	6 00	6 00		
Drivers' and livery licenses	171 00	96 00	75 00		
Auto permits	133 75	110 00	23 75		
Building permits	35 25		35 25		
Peddlers' licenses	6 00		6 00		
	1,544 12	1,206 09	367 03	29 00	338 03
Buffalo Park					
Timber dues	96 25	16 75	79 50		
Hay dues	32 50	25 40	7 10		
Grazing rental	28 00	72 00		44 00	
Auto permits	15 00	10 00	5 00		
Miscellaneous	39 85		39 85		
Motor license	5 00		5 00		
Ice	10 25		10 25		
	226 85	124 15	146 70	44 00	102 70

SESSIONAL PAPER No. 12

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1922, as Compared with the Previous Year—*Concluded*

Particulars	Fiscal Year 1921-22	Fiscal Year 1920-21	Increase	Decrease	Net Increase
Glacier Park	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Rent	53 88	33 07	20 81		
Camping permits	9 00	2 00	7 00		
Grazing rental	30 00	35 00		5 00	
Timber dues	4 50	2 25	2 25		
Dog licenses	30 00	27 00	3 00		
Restaurant licenses	20 00	20 00			
Guides' licenses		2 50		2 50	
Drivers' and livery licenses	98 00	106 00		8 00	
Boat licenses		3 00		3 00	
Auto licenses	40 00		40 00		
	285 38	230 82	73 06	18 50	54 56
Elk Island Park					
Camping permits	11 00	3 00	8 00		
Boat licenses	44 00	26 00	18 00		
Building permits	20 00	2 00	18 00		
Miscellaneous		0·50		0 50	
Auto license	5 00		5 00		
	80 00	31 50	49 00	0 50	48 50
Antelope Park					
Grazing rental	1,015 20	409 60	605 60		605 60
Fort Anne Park					
Hay dues	45 00	38 00	7 00		7 00
Isle Aux Noix Reserve					
Hay dues	215 00		215 00		215 00
Kootenay Park					
Timber dues	8 75		8 75		8 75
Moose Mountain Buffalo Reserve					
Grazing rental	452 60	35 60	417 00		417 00
Pt. Pelee Park					
Rent	12 52	1,341 15		1,328 63	
Miscellaneous	8 50		8 50		Decrease
	21 02	1,341 15	8 50	1,328 63	1,320 13
Miscellaneous					
Taxidermists' fees, etc	79 00	4,102 70		4,023 70	Decrease 4,023 70
Totals	74,302 68	76,850 09	11,749 38	14,296 79	Decrease 2,547 41

PART I

DOMINION LANDS

REPORT OF THE COMMISSIONER, J. W. GREENWAY

Applications for Patent—	1920-21	1921-22
Number examined	77,313	72,972
New applications	16,041	9,908
Applications accepted and notifications issued	13,080	9,607
Certificates of recommendation sent out	5,221	2,636

Report of the Chief Inspector of Dominion Lands Agencies, H. G. Cuttle

In referring to the general services rendered to the public in the various land offices in the West, I am pleased to be able to report that it has been of a very satisfactory nature, as will be shown by the detailed reports of the agencies, subagencies and homestead appraisers as submitted by Mr. O. Neff, Inspector of Dominion land agencies in Manitoba and Saskatchewan, and Mr. J. W. Martin, Inspector in Alberta and British Columbia.

During the past year I have visited most of the land agencies, going fully into all matters which would tend to improve the service to the public, and found the general condition to be satisfactory. On my visits I interviewed a number of the homestead appraisers, discussing the better routing of inspections in order to speed up the work generally, and save mileage, and am pleased to report a marked improvement in their general work. There has also been a great number of special investigations in connection with both Dominion lands and seed grain matters, a number of which have been held under oath authorized under special order in council. There has also been considerable work done in connection with the distributions of seed grain, also the listing of accounts and the collection of outstanding indebtedness.

Report of the Inspector of Dominion Lands Agencies for Manitoba and Saskatchewan, O. Neff

AGENCIES

Agency	Homestead entries granted	Land Sales	Applications for patent received	Land entries cancelled	Permits Issued	
		Ordinary and school lands			Timber	Hay
Battleford	343	22	280	640	409	622
Dauphin	611	41	514	613	293	704
Moose Jaw	334	13	883	552	3	1,070
Prince Albert	1,227	24	604	830	669	1,504
Saskatoon	547	20	606	533	64	747
Swift Current	287	15	1,019	766	91	363
Winnipeg	877	51	1,183	1,062	...	
The Pas*	Mining locations (813) Assessment payments (19)					
Total	4,226	186	5,089	4,996	1,529	5,010
Compared with 1920-21	2,394	254	8,836	5,041	2,042	7,973
Compared with 1919-20	3,292	285	14,352	4,526	4,287	8,669

*The Pas office is that of a mining recorder who is also subagent.

SUBAGENCIES

Name of subagent	Subagency	Applications for						
		Homesteads	Grazing leases	Grazing permits	Patents	Inspections	Timber Permits	Hay permits
C. J. Lee	Assiniboia	83	9	18	169	64		23
P. Goulding	Canwood	118	4	11	58	37	35	68
J. Cusack	Empress	9	2	1	42	26		5
W. H. Holland	Lloydminster	40	19	30	25	23	38	36
C. H. Stockdale	Maple Creek	64	28	44	132	55	22	20
J. T. McCordic	Meadow Lake	22	11	4	18	19	29	61
W. J. Young	Melfort	176	1	24	79	77	13	24
J. Deans	North Battleford	79	41	32	42	57	24	118
D. McMurphy	Preeceville	237			113	109	2	67
A. C. Reed	Turtleford	80	8	3	57	58	12	14
Wm. Buxton	Tisdale	240	4	2	153	125	40	83
W. B. McLellan	The Pas	14	7		1	1	58	22
M. Langstaff	Wadena	221		2	87	127		1
Total		1,383	134	171	976	778	273	548
Compared with 1920–21		747	157	200	2,354	568	328	1,064
Compared with 1919–20		836	350		4,317	749	284	1,316

HOMESTEAD INSPECTORS, PRINCIPAL WORK PERFORMED BY

Name	Headquarters	Land inspections made	Applications for patent	Miles travelled	
				Wagon	Rail
D. Anderson	Battleford	271	56	6,727	946
N. F. Leach	"	294	102	5,560	4,145
G. L. Speers	Dauphin	387	171	4,414	6,605
T. C. Martin	"	412	167	8,229	4,705
Robt. Hunt	"	521	141	6,322	284
W. J. Morrison	Prince Albert	216	65	2,958	2,640
S. Taylor	"	245	10	5,365	688
E. H. E. Webb-Bowen	"	379	61	2,976	2,427
W. W. Whelan	"	257	38	4,387	1,706
C. E. Barr	Moose Jaw	248	13	7,100	1,696
W. Erratt	"	504	14	10,118	1,413
A. Hamilton	"	276	110	4,883	14,315
E. J. Hober	"	478		9,571	5,079
F. G. Arnold	"	29	142	768	7,445
A. E. Mosses	Saskatoon	340	149	8,346	1,134
A. E. Henke	"	250	47	5,844	2,556
J. A. Balfour	"				
A. Smyth	"	267	45	5,932	5,703
J. DeBalinhard	"	505	60	6,981	2,552
L. Lepine	Winnipeg	283	42	2,484	4,847
W. Lagimodière	"	533	119	3,847	3,735
H. W. Mabb	"	457	129	4,004	1,098
W. D. Gillespie	"	690	234	5,168	2,500
Geo. McGowan	"	278	158	2,704	3,285
A. C. Douglas	"	54	18	598	1,389
W. Shields	Swift Current	447	178	7,644	
J. Furnis	"	372	26	6,629	42
P. McLaren	"	275	79	7,824	1,360
J. A. McDonald	"	435	131	6,671	1,699
Total		9,703	2,505	154,054	85,994
Compared with 1920–21		11,049	2,746	165,791	85,647
Compared with 1919–20		10,222	3,050	149,521	85,101

SESSIONAL PAPER No. 12

Report of the Inspector of Dominion Lands Agencies for Alberta and British Columbia, J. W. Martin

AGENCIES

Agency	Homestead entries granted	Soldier grants	Land sales	Applications for patent received	Land entries cancelled	Permits issued	
			Ordinary and school lands			Timber	Hay
Calgary	341	85	16	716	531	474	578
Edmonton	1,668	308	60	1,348	2,089	1,529	1,467
Grande Prairie	312	96	16	384	362	397	237
Kamloops	113	15	14	101	63	363	42
Lethbridge	149	27	5	409	264	454	85
New Westminster	41	48	5	40	36		
Peace River	461	109	21	279	681	500	388
Revelstoke	49	7		22	26	95	
Total	3,134	695	137	3,299	4,052	3,812	2,797
1920–21	2,994	1,232	249	6,947	4,056	4,155	3,830

SUBAGENCIES

Name of Subagent	Subagency	Period	Applications for					
			Homesteads	Soldier grants	Patent	Inspections	Timber permits	Hay permits
Rennison, Mrs. G.M.	Athabasca		59	6	43	38	67	103
Dodds, Geo. E.	Durlingville		91	7	17	60	72	75
Requier, E. E.	Donnelly		36	6	60	31	56	2
Cusack, J.	Empress		36	10	73	47	4	4
Jackson, W	Entwistle		49	4	50	19	6	26
Glover, F.	Edson		51	5	31	14	9	16
Manning, Jos.	McMurray		1					2
Barber, J. C.	Ft. St. John	11 months.	37	7	2	16	43	7
Edgecombe, H. W.	Ft. Vermilion	11 "	52	10	20	9		70
Reynolds, H.	High Prairie		56	9	33	14	15	54
Holland, W. H.	Lloydminster		25	8	19	8	9	22
Hamel, P. D.	Lac la Biche		70	4	37	30	25	52
Robinson, A. W.	Medicine Hat		58	10	137	46	1	12
Agar, Norval	Provost		37	5	69	46	4	26
Jamieson, Th.	Pouce Coupé	11 months.	72	20	64	36	15	24
Hankinson, R. T.	Rocky Mtn. Hse.		81	12	49	25	25	33
Row, Cuthbert	Red Deer		23	3	14	16	24	6
Lacey, Jno	Salmon Arm		38		10	25		
Gray, W. B	Stettler		31	5	73	20		2
Fildes, J. M.	Spirit River		42	13	69	35	50	51
LaPlante, J. R.	St. Lina		126	12	51	52	21	38
Racicot, B	St. Paul des Métis	6 months.	37	3	14	15	23	
Sutton, W. E	Vermilion		44	1	18	59	3	6
Wood, Wm. J.	Westlock		120	23	104	69	59	41
Todd, H. E.	Wetaskiwin	Closed.	40	1	13	19	2	17
Torgerson, J. S.	Whitecourt		33	3	12	19	13	8
Rayment, Mary	Youngstown		63	9	99	62		46
Wenham, M	Yeoford		78	2	33	24	12	24
Totals			1,486	198	1,214	854	558	767
1920–21.			1,203	389	2,738	681	542	1,490

HOMESTEAD INSPECTORS, PRINCIPAL WORK PERFORMED BY

Name	Headquarters	Land Inspections made	Applications for patent taken	Miles travelled	
				Wagon	Rail
Benzie, J. M.	Kamloops	323	52	4,735	3,095
Cook, H.	Revelstoke	102	12	469	4,733
Cunningham, T. J.	Edmonton	271	53	5,615	4,617
Doze, I. S.	Edmonton	3 5	44	4,117	1,118
Fleming, G. W.	Calgary	178	165	4,284	3,421
Griffin, A. H.	Edmonton	485	18	3,822	3,704
Hagen, S. C	Edmonton	437	54	5,544	1,878
Horne, J. A	Edmonton	433	33	5,894	3,228
Key, A. E.	Peace River	109	9	1,516	3,700
Kembry, R. A.	Calgary	293	49	11,030	3,592
Magee, W. D.	New Westminster	150		1,082	2,125
Mayberry, W. J	Lethbridge	413	69	8,265	1,941
McCowan, H. S.	Edmonton	492	32	4,825	772
McConnochie, A	Edmonton	288	42	4,190	3,145
McMullen, J. E.	Peace River	273	10	4,077	2,106
Newton, T. M	Grande Prairie	165	21	6,724	
Nurcombe, J.	Edmonton	350	30	4,009	3,920
Smith, L. T.	Grande Prairie	216	18	6,578	180
Tempany, W.	Calgary	628	27	12,397	1,476
Taylor, P. E.	Edmonton	211	12	2,300	1,392
Wilcox, D. E.	Lethbridge	330	95	6,318	546
Woodlock, P. A.	Calgary	405	71	11,208	3,890
Wynne, A. E.	Edmonton	356	54	8,096	1,086
Totals		7,293	970	127,095	55,665
1920-21.		7,250	816	109,178	55,155

REPORT OF THE AGENT OF DOMINION LANDS, D. J. ROSE, BATTLEFORD, SASKATCHEWAN

	Number	Revenue	Total
Land Patent Branch—			
Homestead fees	344	$ 3,440 00	
Soldier grants	84	.....	
Improvements	57	2,277 25	
Land sales (cash)	21	1,091 39	
Pre-emption payments	45	12,829 04	
Purchased homestead payments	13	2,719 97	
Searches, map sales, office fees, etc.	209	82 25	
Applications for patent	280	.....	
Applications for inspection	341	.....	
Entries cancelled	640	.....	
Sundries	6	92 75	
Total			$ 22,532 65
Timber and Grazing Branch—			
Timber permits	286	$ 2,157 71	
Timber seizures	15	376 55	
Hay permits	459	1,875 25	
Grazing rentals (cash)	420	2,249 38	
Grazing rentals (scrip)	5	9 00	
Total			$ 6,667 89
Forestry Branch—			
Permit fees and rental	193	$ 515 45	
Grazing rent, etc.	125	2,722 00	
Hay dues, etc.	35	440 00	
Total			$ 3,677 45
Reclamation Service—			
Sales	Sale	$ 44 05	
Total			$ 44 05
Mining Lands and Yukon Branch—			
Mining fees	26	$ 180 00	
Rental	2	140 49	
Total			$ 320 49

REPORT OF THE AGENT OF DOMINION LANDS, D. J. ROSE, BATTLEFORD, SASKATCHEWAN—*Con.*

	Number	Revenue	Total
School Lands Branch—			
Timber permits	12	$ 52 50	
Hay permits	289	1,064 75	
Grazing rentals	423	7,653 02	
Cultivation permits	2	78 50	
Total			$ [illegible] 77
Miscellaneous—			
Seed grain and provision payments	65	$ 5,534 14	
Sundries	1	2 75	
Total			$ 5,536 89
Grand total			$ 47,268 19

REPORT OF THE AGENT OF DOMINION LANDS, W. E. TALBOT, CALGARY, ALBERTA

	Number	Revenue	Total
Land Patents Branch—			
Soldier grants	85	.....	
Homestead fees	341	$ 3,410 00	
Improvements	88	4,889 03	
Land sales	16	2,201 84	
Pre-emption payments	443	170,136 87	
Purchased homestead payments	29	5,751 55	
Searches, etc	401	33 65	
Applications for patent	716	.....	
Applications for cancellation	393	.....	
Entries cancelled	531	.....	
Total			$186,422 94
Timber and Grazing Branch—			
Ground rent	45	$ 7,933 71	
Royalty on sales	30	15,698 71	
Timber permits	171	7,038 34	
Timber seizures	14	369 34	
Hay permits	223	1,127 25	
Grazing rentals	578	6,787 50	
Sundries	11	18 00	
Total			$ 38,972 85
Forestry Branch—			
Permit fees and rental	289	$ 16,879 94	
Seizures	2	569 17	
Grazing rent	237	8,368 60	
Hay dues	13	79 50	
Total			$ 25,897 21
Reclamation Service—			
Reservoir rental	1	$ 121 30	
Total			$ 121 30
Mining Lands and Yukon Branch—			
Mining fees (quartz and placer)	569	$ 4,292 00	
Rental (coal)	347	46,956 64	
Royalty	268	63,817 93	
Petroleum and natural gas	407	38,565 52	
Domestic coal permits	1	5 00	
Alkali	2	432 50	
Dredging	2	35 00	
Total			$154,104 59
School Lands Branch—			
General sales	19	$ 6,945 49	
Timber permits	8	198 85	
Hay payments	342	1,669 61	
Grazing rentals	1,155	24,687 27	
Coal rentals and fees	48	3,847 89	
Coal royalty	28	2,912 12	
Petroleum and natural gas	47	2,754 05	
Cultivation permit	1	14 08	
Gravel fees	1	25 00	
Total			$ 49,054 36
Miscellaneous—			
Seed grain and provision payments	172	$ 35,018 91	
Total			$ 35,018 91
Grand total			$483,592 16

REPORT OF THE AGENT OF DOMINION LANDS, E. WIDMEYER, DAUPHIN, MANITOBA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	611	$ 6,090 00	
Soldier grants	212	.....	
Improvements	58	2,126 80	
Land sales (cash)	41	1,392 77	
Search	1,523	660 75	
Applications for patent	503	.....	
Applications for inspection	589	.....	
Entries cancelled	593	.....	
Total			$ 10,270 32
Timber and Grazing Branch—			
Timber permits	316	$ 2,553 32	
Timber seizures	27	670 18	
Hay permits	444	1,578 73	
Grazing rentals	44	654 89	
Total			$ 5,457 12
Forestry Branch—			
Timber permits	1,226	$ 7,934 83	
Permit fees and rentals	39	186 00	
Seizures	52	838 14	
Grazing rentals	147	1,504 45	
Hay dues	271	1,260 75	
Total			$ 11,724 17
Mining Lands and Yukon Branch—			
Fees	12	$ 54 00	
Petroleum and gas	174	12,322 07	
Coal permits	2	17 00	
Total			$ 12,393 07
School Lands Branch—			
General sales	5	$ 807 93	
Timber permits	...	.....	
Hay permits	262	891 00	
Grazing rentals	72	932 73	
Cultivation permits	2	23 00	
Petroleum and gas	3	66 00	
Total			$ 2,720 66
Miscellaneous—			
Seed grain payments	10	$ 308 00	
Total			$ 308 00
Grand total			$ 42,873 34

REPORT OF THE AGENT OF DOMINION LANDS, A. NORQUAY, EDMONTON, ALBERTA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	1,668	$ 16,640 00	
Soldier grants	308	.....	
Improvements	256	8,658 10	
Land sales (cash)	60	3,752 13	
Pre-emption payments	5	803 45	
Searches	63	21 60	
Applications for patent	6,482	.....	
Applications for inspection	1,017	.....	
Entries cancelled	2,089	.....	
Sundries	...	30 00	
Total			$ 29,905 28
Timber and Grazing Lands Branch—			
Ground rent	44	$ 8,148 51	
Royalty on sales	49	16,459 07	
Timber permits	1,418	62,699 69	
Timber seizures	125	7,020 86	
Hay permits	977	3,005 10	
Grazing rentals (cash)	304	1,361 37	
Sundries	146	11,558 67	
Total			$110,253 27

REPORT OF THE AGENT OF DOMINION LANDS, A. NORQUAY, EDMONTON, ALBERTA—*Con.*

	Number	Revenue	Total
Forestry Branch—			
Timber dues	38	$ 21,788 91	
Permit fees and rental	53	63 25	
Seizures	38	410 05	
Grazing rent, etc	52	798 01	
Hay dues	20	155 25	
Total			$ 23,215 47
Reclamation Service			
Sales	9	$ 631 92	
Total			$ 631 92
Mining Lands and Yukon Branch			
Mining fees	81	$ 543 00	
Rental	91	38,370 59	
Royalty	97	57,891 83	
Coal permits	16	6,786 00	
Sundries	615	49,476 70	
Total			$153,068 12
School Lands Branch—			
General sales	2	$ 1,228 15	
Timber permits	60	3,817 74	
Hay permits	475	1,121 95	
Grazing rentals	493	8,179 77	
Mining fees	1	5 00	
Coal rentals	11	836 15	
Coal royalty	2	557 93	
Petroleum	1	10 00	
Sundries	29	3,055 70	
Total			$ 18,812 39
Miscellaneous—			
Seed grain and provision payments	147	$ 7,488 38	
Sundries	7	752 13	
Total			$ 8,240 51
Grand total			$344,126 96

REPORT OF THE AGENT OF DOMINION LANDS, P. L. CHRISTIE, GRANDE PRAIRIE, ALBERTA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	312	$ 3,120 00	
Soldier grants	96		
Improvements	52	2,113 73	
Land sales (cash)	16	906 44	
Land sales (scrip)	1	160 00	
Searches, map sales, office fees, etc.	7	3 25	
Applications for patent	384		
Applications for inspection	212		
Entries cancelled	362		
Total			$ 6,303 42
Timber and Grazing Branch—			
Bonus (hay)	1	$ 37 50	
Timber permits	397	1,969 86	
Timber seizures	3	196 05	
Hay permits	176	479 00	
Grazing rentals (cash)	108	2,324 86	
Timber permits (excess)	87	595 36	
Hay permits (excess)	1	2 25	
Sundries (lease fees and assignments)	7	29 00	
Total			$ 5,633 88
Mining Lands and Yukon Branch—			
Mining fees	409	$ 3,945 00	
Rental	14	440 75	
Royalty	6	31 59	
Petroleum and natural gas	342	23,436 78	
Dredging	8	440 00	
Sundries (assignments and lease fees)	181	510 85	
Total			$ 28,804 97

REPORT OF THE AGENT OF DOMINION LANDS, F. L. CHRISTIE, GRANDE PRAIRIE, ALBERTA—(Con.

	Number	Revenue	Total
Reclamation Service—			
Sales	1	$ 79 36	
Total			$ 79 36
School Lands Branch—			
Hay permits (excess)	1	$ 25	
Hay permits	65	145 50	
Grazing rentals	64	1,396 64	
Petroleum and natural gas	7	390 00	
Gravel tolls	1	1 00	
Petroleum and natural gas assignment fees	1	3 00	
Timber seizures	2	37 20	
Total			$ 1,973 59
Miscellaneous—			
Seed grain and provision payments	32	$ 3,022 70	
Total			$ 3,022 70
Grand total			$ 45,817 92

REPORT OF THE AGENT OF DOMINION LANDS, W. C. COWELL, KAMLOOPS, BRITISH COLUMBIA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	113	$ 1,130 00	
Soldier grants	15		
Improvements	51	3,567 75	
Land sales	14	1,349 70	
Searches	135	98 95	
Applications for patent	100		
Applications for inspection	99		
Entries cancelled	63		
Sundries	6	17 14	
Total			$ 6,163 54
Timber and Grazing Branch—			
Sale scale books	14	$ 31 50	
Bonus	3	1,329 85	
Ground rent	89	8,323 80	
Royalty on sales	49	19,603 85	
Timber permits	342	4,353 77	
Timber seizures	4	125 97	
Hay permits	18	27 50	
Grazing rentals	480	7,413 76	
Fire guarding	4	943 51	
Sundries	28	154 20	
Total			$ 42,307 71
Forestry Branch—			
Timber dues	36	$ 6,543 48	
Permit dues	21	18 75	
Grazing rent	17	302 90	
Hay dues	24	77 75	
Total			$ 6,942 88
Mining Lands and Yukon Branch—			
Mining fees	6	$ 50 00	
Rental	8	192 30	
Coal permits	2	200 00	
Sundries	1	1 00	
Total			$ 443 30
Miscellaneous—			
Seed grain collections	5	$ 105 02	
Total			$ 105 02
Grand total			$ 55,962 45

REPORT OF THE AGENT OF DOMINION LANDS, J. A. REID, LETHBRIDGE, ALBERTA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	149	$ 1,490 00	
Soldier grants	27		
Improvements	58	2,891 27	
Land sales (Cash)	5	845 20	
Pre-emption payments	76	21,249 15	
Purchased homestead payments	15	1,333 80	
Searches, etc.	26	10 01	
Applications for patent	409		
Applications for inspection	169		
Entries cancelled	200		
Total			$ 27,819 63
Timber and Grazing Branch			
Timber permits	10	1,007 [illegible]	
Timber seizures	12	240 06	
Hay permits	16	93 10	
Grazing rentals (Cash)	946	17,990 37	
Improvements	2	25 00	
Sundries	3	9 [illegible]	
Total			$ 19,456 72
Forestry Branch—			
Timber dues	439	2,409 [illegible]	
Permit fees and rental	451	457 06	
Seizures	15	121 88	
Grazing rent, etc.	294	8,841 00	
Hay dues, etc.	2	7 [illegible]	
Total			$ 11,837 84
Mining Lands and Yukon Branch—			
Mining fees	62	710 [illegible]	
Rental	86	14,483 22	
Royalty	167	53,504 [illegible]	
Petroleum and natural gas	1,208	67,465 98	
Sundries	68	203 [illegible]	
Total			$137,966 89
School Lands Branch—			
Timber seizures	1	12 32	
Hay permits	37	47 25	
Grazing rentals	433	10,395 [illegible]	
Mining fees	4	20 00	
Coal rental, petroleum and natural gas	126	7,096 [illegible]	
Coal royalty	16	14,003 [illegible]	
Cultivation permits	7	276 [illegible]	
Sundries	5	[illegible]	
Total			$ 31,866 83
Miscellaneous—			
Seed grain and provision payments	90	8,872 [illegible]	
Total			$ 8,872 05
Grand total			$245,869 99

REPORT OF THE ACTING AGENT OF DOMINION LANDS, G. A. NICHOLSON, MOOSE JAW, SASKATCHEWAN

	Number	Revenue	Total
Land Patents Branch			
Soldier grants	42		
Homestead fees	334	3,340 00	
Improvements	72	2,850 89	
Land sales (Cash)	12	1,944 40	
Pre-emption payments	303	88,948 09	
Purchased homestead payments	24	4,716 93	
Searches	242	93 75	
Applications for patent	883		
Applications for inspection	550		
Entries cancelled	552		
Total			$101,894 06

REPORT OF THE ACTING AGENT OF DOMINION LANDS, G. A. NICHOLSON, MOOSE JAW, SASKATCHEWAN—*Con.*

	Number	Revenue	Total
Timber and Grazing Branch—			
Timber permits	3	$ 21 50	
Hay permits	540	1,682 20	
Grazing rentals	1046	8,130 68	
Sundries	3	9 00	
Total			9,843 38
Forestry Branch—			
Surface rental	18	$ 103 00	
Timber dues	9	22 20	
Permit fees and rental	140	409 60	
Seizures	1	12 00	
Grazing rental	183	1,854 15	
Hay dues	99	588 75	
Total			3,259 70
Mining Lands and Yukon Branch—			
Mining fees	188	$ 2,056 00	
Rental	47	1,664 39	
Royalty	119	2,486 33	
Sundries	28	2,030 00	
Total			8,236 72
School Lands Branch—			
General sales	13	$ 4,569 17	
Hay permits	528	1,674 45	
Grazing rentals	980	19,431 67	
Mining fees	13	59 00	
Coal rental	8	185 12	
Coal royalty	28	2,570 66	
Cultivation permits	8	228 00	
Sundries	3	266 17	
Total			28,984 24
Miscellaneous—			
Seed grain and provision payments	232	$ 34,567 26	
Total			34,567 26
Grand total			$186,785 36

REPORT OF THE AGENT OF DOMINION LANDS, W. D. MAGEE, NEW WESTMINSTER, BRITISH COLUMBIA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	41	$ 410 00	
Soldier grants	47	.....	
Improvements	8	422 00	
Land sales	5	552 30	
Purchased homestead payments	12	484 93	
Searches, map sales, office fees, etc	12	5 70	
Applications for patent	37	.....	
Applications for inspection	74	.....	
Entries cancelled	36	.....	
Sundries, patent fees, etc	9	15 00	
Total			$ 1,889 93
Mining Lands and Yukon Branch—			
Mining fees	200	$ 1,000 00	
Rentals	1,387	55,546 10	
Bonus payments	76	532 50	
Coal applications	2	965 00	
Sundries, assignments, etc	81	245 50	
Total			58,289 10
Grand total			$ 60,179 03

SESSIONAL PAPER No. 12

REPORT OF THE AGENT OF DOMINION LANDS, R. M. TREEN, PRINCE ALBERT, SASKATCHEWAN

Land Patents Branch—	Number	Revenue	Total
Homestead fees	1,227	$ 12,270 00	
Pre-emption fees	1	10 00	
Soldier grants	258	.....	
Improvements	116	4,760 75	
Land sales (cash)	24	1,749 17	
Searches, map sales, office fees, etc.	252	88 50	
Applications for patent	604	.....	
Applications for inspection	649	.....	
Entries cancelled	830	.....	
Sundries	1	10 00	
Total			$18,888 42
Timber and Grazing Branch—			
Bonus	4	$ 4,291 80	
Ground rent	12	11,078 45	
Royalty on sales	64	46,845 06	
Timber permits	631	19,159 06	
Timber seizures	82	1,225 03	
Hay permits	1,088	2,997 98	
Grazing rentals (cash)	360	1,654 17	
Grazing rentals (scrip)	2	18 00	
Sundries	1	6 00	
Total			87,375 55
Forestry Branch—			
Timber dues	815	$20,600 25	
Seizures	11	242 01	
Grazing rent, etc.	75	1,269 76	
Hay dues, etc.	119	824 25	
Total			22,936 27
Mining Lands and Yukon Branch—			
Mining fees	20	$ 100 00	
Rental	7	4,632 00	
Royalty	1	6 00	
Coal permits	2	592 50	
Sundries	15	3,632 30	
Total			8,962 80
School Lands Branch—			
Timber permits	35	$ 526 61	
Hay permits	416	906 48	
Grazing rentals	296	3,959 66	
Coal permits	4	41 50	
Cultivation permits	2	8 25	
Sundries	5	39 95	
Total			5,482 45
Miscellaneous—			
Seed grain and provision payments	46	$ 2,749 89	
Total			2,749 89
Grand total			$146,595 38

REPORT OF THE ACTING AGENT OF DOMINION LANDS, H. F. FINCHAM, PEACE RIVER, ALBERTA

Land Patents Branch—	Number	Revenue	Total
Homestead fees	461	$ 4,610 00	
Improvements	53	2,508 50	
Land sales	21	1,662 35	
Searches, sales, etc.	9	4 10	
Applications for patent	279	.....	
Applications for inspection	227	.....	
Entries cancelled	681	.....	
Soldier grants	109	.....	
Total			$8,784 95

REPORT OF THE ACTING AGENT OF DOMINION LANDS, H. F. FINCHAM, PEACE RIVER, ALBERTA—*Con.*

	Number	Revenue	Total
Timber and Grazing Branch—			
Timber permits	499	$ 3,581 89	
Hay permits	292	1,069 15	
Grazing rentals	162	1,113 07	
Total			$ 5,764 11
Forestry Branch—			
Grazing rental	1	$ 9 37	
Hay dues	7	88 79	
Total			98 16
Mining Lands and Yukon Branch—			
Coal royalty	2	$ 42 75	
Mining fees	22	167 00	
Placer	39	390 00	
Dredging	26	1,147 00	
Petroleum and natural gas	532	38,072 29	
Coal permits	9	90 75	
Prospecting fees	178	712 00	
Total			40,621 79
School Lands Branch—			
General sales	1	$ 30 00	
Hay permits	90	389 20	
Grazing rentals	51	1,185 41	
Petroleum and natural gas	36	2,782 39	
Coal rentals	3	50 00	
Cultivation permits	1	5 00	
Total			4,442 00
Miscellaneous—			
Seed grain and provisions	10	$ 659 90	
Total			659 90
Grand total			$60,370 91

REPORT OF THE AGENT OF DOMINION LANDS, T. J. WADMAN, REVELSTOKE, BRITISH COLUMBIA

	Number	Revenue	Total
Land Patents Branch -			
Homestead entry fees	49	$ 490 00	
Soldier grant entries	7	.....	
Improvements	28	1,602 45	
Townsite payments	2	109 06	
Payments	2	95 83	
Searches, map sales, etc.	42	20 30	
Applications for patent	22	.....	
Applications for inspection	21	.....	
Entries cancelled	26	.....	
Sundries	1	35 00	
Total			$2,352 64
Timber and Grazing Branch—			
Bonus	2	$ 555 01	
Ground rentals	97	5,273 57	
Royalties	23	13,267 83	
Timber permits	95	2,350 30	
Fire guarding charges	12	470 53	
Sundries	24	131 61	
Total			22,048 85
Mining Lands and Yukon Branch—			
Application fees, petroleum and natural gas leases	14	$ 70 00	
Rental, petroleum and natural gas leases	14	404 30	
Total			474 30
Grand total			$24,875 79

SESSIONAL PAPER No. 12

REPORT OF THE AGENT OF DOMINION LANDS, M. A. MCINNES, SASKATOON, SASKATCHEWAN

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	547	$ 5,450 00	
Soldier grants	48	.....	
Improvements	73	3,538 65	
Land sales (cash)	20	1,540 93	
Land sales (scrip)	1	.....	
Pre-emption payments	118	37,254 98	
Purchased homestead payments	30	6,407 52	
Office fees, etc.	362	120 00	
Applications for patent	604	.....	
Applications for inspection	500	.....	
Entries cancelled	532	.....	
Sundries	1	3 00	
Total			$54,315 08
Timber and Grazing Branch—			
Timber permits	60	$ 247 96	
Timber seizures	2	70 58	
Hay permits	452	1,600 61	
Grazing rentals (cash)	168	813 95	
Sundries	3	9 00	
Total			$ 2,742 10
Forestry Branch—			
Timber dues	33	$ 115 07	
Permit fees and rental	128	470 36	
Seizures	13	169 30	
Grazing rents, etc.	95	1,796 06	
Hay dues, etc.	104	871 25	
Total			$ 3,422 04
Reclamation Service—			
Sales	1	$ 37 20	
Total			$ 37 20
Mining Lands and Yukon Branch—			
Mining fees	27	$ 212 75	
Rental	3	238 50	
Total			$ 451 25
School Lands Branch—			
General sales	4	$ 2,383 48	
Timber permits	4	18 00	
Hay permits	524	1,993 14	
Grazing rentals	750	11,862 70	
Mining fees	1	17 50	
Cultivation permits	17	353 00	
Sundries	3	132 50	
Total			$16,760 32
Miscellaneous—			
Seed grain and provision payment	191	$27,491 02	
Total			$27,491 02
Grand total			$105,219 01

REPORT OF THE AGENT OF DOMINION LANDS, S. LEE, SWIFT CURRENT, SASKATCHEWAN

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	287	$ 2,790 00	
Pre-emption fees	2	.....	
Purchased homestead fees	1	.....	
Soldier settlement grants	74	.....	
Improvements	81	3,044 60	
Land sales (cash)	6	865 97	
Miscellaneous	4	4 00	
Pre-emption payments	432	155,450 65	
Purchased homestead payments	21	4,654 47	
Searches, map sales, office fees, etc.	363	139 00	
Applications for patent	1,015	.....	
Applications for inspection	716	.....	
Entries cancelled	766	.....	
Certificates of recommendation	755	.....	
Total			$166,948 69

REPORT OF THE AGENT OF DOMINION LANDS, S. LEE, SWIFT CURRENT, SASKATCHEWAN—*Con.*

	Number	Revenue	Total
Timber and Grazing Lands Branch—			
Timber permits	20	$ 120 67	
Timber seizures	2	1 00	
Hay permits	211	577 00	
Grazing rentals (cash)	1,136	16,609 75	
Sundries	6	21 30	
Total			$17,329 70
Forestry Branch—			
Permit fees and rental	315	$ 739 48	
Seizures	10	58 20	
Grazing rent, etc	436	10,328 97	
Miscellaneous	11	63 75	
Total			11,190 40
Irrigation Branch—			
Sales	2	$1,816 87	
Total			1,816 87
Mining Lands and Yukon Branch—			
Mining fees, etc	60	$ 265 00	
Rental—coal	17	436 40	
Royalty—coal	27	295 16	
Petroleum and natural gas	67	3,721 30	
Quarrying	12	270 00	
Alkali	3	235 00	
Total			5,222 86
School Lands Branch—			
General sales	4	$1,703 57	
Timber permits	1	5 05	
Hay permits	152	355 25	
Grazing rentals	714	17,436 36	
Petroleum and natural gas	4	288 90	
Cultivation permits	24	1,784 35	
Sundries	5	11 25	
Total			21,584 73
Miscellaneous—			
Seed grain and provisions payments	347	$55,236 62	
Total			55,236 62
Grand total			$279,329 87

REPORT OF THE AGENT OF DOMINION LANDS, L. P. O. NOEL, WINNIPEG, MANITOBA

	Number	Revenue	Total
Land Patents Branch—			
Homestead fees	877	$8,770 00	
Soldier grants	168	.....	
Improvements	152	3,298 33	
Land sales (cash)	46	4,064 57	
Searches, maps, etc	1,670	752 60	
Sundries	2	13 00	
Applications for patent	1,183	.....	
Applications for inspection	1,283	.....	
Entries cancelled	1,062	.....	
Total			$21,898 50
Timber and Grazing Lands Branch—			
Grazing rentals	89	$668 37	
Hay leases	1	8 50	
Total			676 87
Mining Lands and Yukon Branch—			
Mining fees	1,787	$13,924 48	
Quarries	45	1,184 29	
Petroleum and natural gas	14	864 45	
Total			15,973 22
School Lands Branch—			
Sales	10	$2,402 76	
Hay leases	2	80 00	
Grazing rentals	162	2,539 65	
Mining fees	6	35 00	
Petroleum and natural gas	8	1,480 00	
Cultivation permits	10	486 50	
Total			7,023 91
Miscellaneous—			
Seed grain and relief payments		$7,169 16	
Total			7,169 16
Grand total			$52,741 66

REPORT OF THE CONTROLLER OF THE LAND PATENTS BRANCH AND REGISTRAR OF DOMINION LANDS PATENTS, N. O. COTE

With statements, A to L in relation thereto

LETTERS PATENT

The number of letters patent issued was 13,116, covering an area of 2,024,519 acres, which may be classified as follows:—

Province	Patents	Acres
Manitoba	2,395	362,175
Saskatchewan	5,551	883,043
Alberta	4,792	739,849
British Columbia	342	38,761
Yukon Territory	20	391
Northwest Territories	16	300
	13,116	2,024,519

These grants are given in detail in the statements marked A to G, inclusive, and may be summarized as follows:—

Grants	Patents	Acres
Homesteads	9,656	1,501,399
Sales	1,261	198,842
Pre-emptions	1,481	234,393
Purchased homesteads	178	26,140
Railways	96	3,154
Special or free grants	362	48,407
Northwest Halfbreeds	4	723
Licenses of occupation	10	410
Soldier grants	63	10,015
Hudson's Bay Company	5	1,036
	13,116	2,024,519

There was a decrease of 4,831 letters patent and a decrease in the area patented of 728,975 acres as compared with the previous year.

There are recorded in the Lands Patent Branch 446,331 letters patent, aggregating 99,607,938 acres, which have been issued since May, 1873, to March 31, 1922.

LANDS DISPOSED OF

Seven thousand three hundred and forty-nine homestead entries were granted, aggregating an approximate area of 1,175,840 acres, made up by provinces as follows:—

Province	Homestead entries
Manitoba	1,488
Saskatchewan	2,733
Alberta	2,928
British Columbia	200
	7,349

There was an increase of 1,960 in the number of homestead entries granted, as compared with the previous year.

By land agencies the 7,349 homestead entries are made up as follows:—

	Entries
Manitoba—	
Dauphin	611
Winnipeg	877
	1,488
Saskatchewan—	
Battleford	343
Moose Jaw	334
Prince Albert	1,228
Saskatoon	548
Swift Current	280
	2,733
Alberta—	
Calgary	341
Edmonton	1,664
Grande Prairie	312
Lethbridge	149
Peace River	462
	2,928
British Columbia—	
Kamloops	111
New Westminster	41
Revelstoke	48
	200

The 7,349 entrants for homesteads represented 15,573 persons, as compiled from information obtained from each entrant. Of these entries 2,162 were made by residents of the several provinces of the Dominion; 3 by Canadians who had returned from the United States, and 946 by persons who had previously obtained homestead entries, but which entries had been cancelled by default or at the request of the entrants in order, in most cases, to enter for other lands; 1,083 were made by persons from the British Isles; 1,505 by people from the United States; 712 by naturalized Austro-Hungarians; 208 by Russians and Finns; 159 by Norwegians; 173 by Swedes; 40 by naturalized Germans; 63 by Frenchmen; 37 by Belgians, and the remaining 258 were made by citizens of various other countries.

There were 1,655 soldier grant entries made during the year, aggregating approximately 264,800 acres, made up by provinces as follows:—

	No. of entries	Acres
Manitoba	383	61,280
Saskatchewan	590	94,400
Alberta	614	98,240
British Columbia	68	10,880
	1,655	264,800

By land agencies as follows:—

Manitoba—		
Dauphin	214	
Winnipeg	169	
		383
Saskatchewan—		
Battleford	95	
Moose Jaw	42	
Prince Albert	298	
Saskatoon	79	
Swift Current	76	
		590

Alberta—		
Calgary	80	
Edmonton	302	
Grande Prairie	96	
Lethbridge	27	
Peace River	109	
		614
British Columbia—		
Kamloops	18	
New Westminster	43	
Revelstoke	7	
		68
		1,655

CANCELLED ENTRIES

There were cancelled 8,554 entries, as follows:—

	Manitoba	Saskatchewan	Alberta	British Columbia
Homesteads	1,846	2,370	3,383	207
Pre-emptions	....	490	149	....
Purchased homesteads	....	29	9	....
Sales	....	36	25	10
Total	1,846	2,925	3,566	217

SALES

Two hundred and ninety-one sales were made for 10,493 acres of land, with an average for each sale of about 36 acres.

ACCOUNTS AND REVENUE

There are at present kept in this branch about 20,300 individual accounts in connection with purchased homesteads, pre-emptions and ordinary sales.

The sum of $742,451.72, including $165,790.25 interest on deferred payments, was received on account of purchased homesteads, pre-emptions and ordinary sales, being a decrease of $961,960.55 as compared with the payments received during the previous year.

The amount of $133,862.69 has also been received for entry fees, improvements and sundries, making a total revenue for the fiscal year of $876,314.41.

REFUNDS

There were 1,075 refunds made, amounting to $55,428.86, as follows:—

722 refunds—Value of improvements collected on cancelled homesteads	$45,340 54
353 refunds—Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which have been cancelled	10,088 32
	$55,428 86

NEWLY SURVEYED LANDS THROWN OPEN TO HOMESTEAD ENTRY

Newly surveyed lands comprised in one hundred and three townships were made available for homestead entry in the following land agencies:—

Dauphin, Man.	in 20	townships
Winnipeg, Man.	" 8	"
Battleford, Sask.	" 5	"
Prince Albert, Sask.	" 15	"
Saskatoon, Sask.	" 1	"
Calgary, Alta.	" 1	"
Edmonton, Alta.	" 1	"
Grande Prairie, Alta.	" 13	"
Peace River, Alta.	" 24	"
New Westminster, B.C.	" 7	"
Kamloops, B.C.	" 5	"
Revelstoke, B.C.	" 3	"

STATEMENT A—Letters patent issued covering Dominion Lands situate in Manitoba, Saskatchewan, and Alberta, Northwest Territories, British Columbia, and the Yukon Territory.

No.	Nature of Grant	From April 1, 1921, to March 31, 1922		From April 1, 1920, to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Alberta Railway and Irrigation Co's sales			1	12
2	British Columbia homesteads	202	21,922	156	18,5[illegible]
3	British Columbia sales	15	1,276	9	402
4	Coal surface sales			1	670
5	Greater Winnipeg Water District			1	2
6	Homesteads, Peace River Block	87	13,850	108	16,716
7	Homesteads	9,363	1,464,675	12,065	1,899,668
8	Hudson's Bay Co	5	1,036	2	108
9	License of occupation	10	410	12	26
10	Military bounty grants	2	319	2	518
11	Military homesteads	2	632		
12	Mining lands sales. (55 acres, under rights)	14	653	12	612
13	Mineral rights. (3,494 acres)	12		5	
14	Northwest half-breed grants	4	723	3	283
15	Parish sales	6	508	7	829
16	Pre-emption sales	1,481	234,393	3,350	531,045
17	Purchased homesteads	178	26,140	406	62,560
18	Quit claim, sales	20	869	16	867
19	Quit claim, special grants	58	7,546	25	2,057
	Railways—				
20	Alberta and Great Waterways Railway Co.	1	7	1	6
21	Calgary and Edmonton Railway Co			1	317
22	Canadian Northern Alberta Railway Co			15	153
23	Canadian Northern Railway Co	20	2,191	24	5,513
24	Canadian Northern Saskatchewan Railway Co	2	14		
25	Canadian Northern Pacific Railway Co.	6	66	12	76
26	Canadian Northern Western Railway Co.	10	90	3	27
27	Canadian Pacific Railway grants	18	126	24	3,026
28	Canadian Pacific Railway roadbed and station grounds	11	135	33	366
29	Central Canada Railway Co	9	133	1	11
30	Edmonton, Dunvegan and British Columbia Railway Co	14	170	8	87
31	Grand Trunk Pacific Railway Co			8	564
32	Grand Trunk Pacific Branch Lines Co	1	1	13	98
33	Kettle Valley Railway Co			43	665
34	Manitoba Southwestern Colonization Railway Co	2	206	1	5
35	Nicola, Kamloops and Similkameen Railway Co	2	15	3	30
36	Sales	348	33,755	464	26,662
37	Sales, Peace River Block	1	61	1	81
38	School lands sales	827	161,649	767	138,688
39	School lands sales, special grants	1	12		
40	Soldier grants	63	10,015	49	7,805
41	Special grants	301	40,530	255	34,791
42	Yukon Territory homesteads	2	320		
43	Yukon Territory sales. (51·65 acres, under rights)	18	71	40	70
	Totals	13,116	2,024,519	17,947	2,753,494

STATEMENT B—Letters patent issued covering Dominion Lands in the Province of Manitoba

No	Nature of Grant	From April 1, 1921, to March 31, 1922		From April 1, 1920, to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Greater Winnipeg Water District			1	2
2	Homesteads	2,063	321,308	2,249	352,465
3	Hudson's Bay Co	1	160		
4	Military bounty grants			1	160
5	Mining lands sales	8	361	12	612
6	Parish sales	6	508	6	777
7	Pre-emption sales	2	320	3	336
8	Quit claim, sales	2	107		
9	Quit claim, special grants	8	421	2	80
	Railways—				
10	Canadian Northern Railway Co	7	45	6	73
11	Canadian Pacific Railway grants			1	24
12	Canadian Pacific Railway roadbed and station grounds	6	37	1	2
13	Manitoba Southwestern Colonization Railway Co	2	206	1	5
14	Sales	71	2,344	80	4,229
15	School lands sales	129	23,839	194	33,172
16	Soldier grants	1	154		
17	Special grants	89	12,365	44	5,489
	Totals	2,395	362,175	2,601	397,426

STATEMENT C—Letters patent issued covering Dominion Lands in the Province of Saskatchewan

No	Nature of Grant	From April 1, 1921, to March 31, 1922		From April 1, 1920, to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Homesteads	3,638	570,939	5,227	823,931
2	Hudson's Bay Co	1	40S		
3	License of occupation	1	1	3	7
4	Military homesteads	1	320		
5	Mining lands sales	5	239		
6	Mineral rights (1,285 acres)	4			
7	Northwest half-breed grants	2	403	1	48
8	Pre-emption sales	952	150,675	2,279	361,561
9	Purchased homesteads	115	17,762	284	44,204
10	Quit claim, sales	13	495	12	612
11	Quit claim, special grants	33	4,544	16	1,577
	Railways—				
12	Canadian Northern Railway Co	13	2,146	16	5,231
13	Canadian Northern Saskatchewan Railway	2	14		
14	Canadian Pacific Railway grants	9	102	19	2,967
15	Canadian Pacific Railway roadbed and station grounds			2	56
16	Edmonton, Dunvegan and British Columbia Railway Co			6	86
17	Grand Trunk Pacific Railway Co			1	
18	Grand Trunk Pacific Branch Lines Co	1	1	2	3
19	Sales	127	6,735	194	12,518
20	School lands sales	511	110,388	402	74,417
21	School lands, special grants	1	12		
22	Soldier grants	37	5,873	32	5,090
23	Special grants	85	11,986	54	6,024
	Totals	5,561	883,043	8,550	1,338,332

STATEMENT D—Letters patent issued covering Dominion Lands in the Province of Alberta

No	Nature of Grant	From April 1, 1921 to March 31, 1922		From April 1, 1920 to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Alberta Railway and Irrigation Co's sales			1	142
2	Coal surface sales			1	670
3	Homesteads	3,662	572,428	4,589	723,272
4	Hudson's Bay Co	3	468	2	108
5	License of occupation	9	409	9	19
6	Military bounty grants	2	319	1	158
7	Military homesteads	1	312		
8	Mining lands sales (55 acres, under rights)	1	53		
9	Mineral rights (2,209 acres)	8		5	
10	Northwest half-breed grants	2	320	2	235
11	Pre-emption sales	527	83,398	1,068	169,148
12	Purchased homesteads	55	8,252	117	18,095
13	Quit claim, sales	5	267	4	255
14	Quit claim, special grants	17	2,581	7	400
	Railways:—				
15	Alberta and Great Waterways Railway Co	1	7	1	6
16	Calgary and Edmonton Railway Co			1	317
17	Canadian Northern Railway Co			2	9
18	Canadian Northern Alberta Railway Co			15	153
19	Canadian Northern Western Railway Co	10	90	3	27
20	Canadian Pacific Railway grants	8	14	3	23
21	Canadian Pacific Railway roadbed and station grounds			1	9
22	Central Canada Railway Co	9	133	1	11
23	Edmonton Dunvegan and British Columbia Railway Co	14	170	2	1
24	Grand Trunk Pacific Railway Co.			7	564
25	Grand Trunk Pacific Branch Lines Co			11	95
26	Sales	135	24,378	180	9,813
27	School lands sales	187	27,422	171	31,100
28	Soldier grants	25	3,988	17	2,715
29	Special grants	111	14,840	149	22,317
	Totals	4,792	739,849	6,370	979,662

STATEMENT E—Letters patent issued covering Dominion Lands in the Province of British Columbia

No	Nature of Grant	From April 1, 1921 to March 31, 1922		From April 1, 1920 to March 31, 1921	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads	202	21,922	156	18,538
2	British Columbia sales	15	1,276	9	402
3	Homesteads, Peace River block	87	13,850	108	16,716
4	Parish sales			1	52
5	Purchased homesteads	8	126	5	70
	Railways:—				
6	Canadian Pacific Railway grants	1	10	1	12
7	Canadian Pacific Railway roadbed and station grounds	5	98	29	299
8	Canadian Northern Pacific Railway Co	6	66	12	76
9	Kettle Valley Railway Co.			43	665
10	Nicola, Kamloops and Similkameen Railway Co	2	15	3	30
11	Sales, Peace River Block	1	61	1	81
12	Special grants	15	1,337	8	961
	Totals	342	38,761	376	37,902

STATEMENT F—Letters patent issued covering Dominion Lands in the Yukon Territory

No.	Nature of Grant	From April 1, 1921 to March 31, 1922		From April 1, 1920 to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Yukon Territory homesteads	2	320		
2	Yukon Territory sales	18	71	40	70
	Totals	20	391	40	70

STATEMENT G—Letters patent issued covering Dominion Lands in the Northwest Territories

No.	Nature of Grant	From April 1, 1921 to March 31, 1922		From April 1, 1920 to March 31, 1921	
		Patents	Acres	Patents	Acres
1	Sales	15	298	10	102
2	Special grants	1	2		
	Totals	16	300	10	102

STATEMENT II.—Number of Homestead Entries made during the fiscal year 1921-22, the nationality of the homesteaders and the provinces in which the entries were made.

Nationalities	Provinces				Total
	Manitoba	Saskatchewan	Alberta	British Columbia	
Canadians from Ontario	121	366	279	20	786
" Quebec	57	127	127	7	318
" Nova Scotia	18	35	29	1	83
" New Brunswick	7	17	28	2	54
" Prince Edward Island	11	18	14	4	47
" Manitoba	241	109	44	4	398
" Saskatchewan	9	154	37	1	201
" Alberta	3	14	200	3	220
" British Columbia		9	28	18	55
Persons who had previous entry	140	326	467	13	946
Newfoundlanders	2		2		4
Canadians returned from the United States		1	2		3
Americans	133	567	790	15	1,505
English	159	272	280	51	762
Scotch	48	81	89	11	229
Irish	17	33	40	2	92
French	18	22	23		63
Belgians	17	15	5		37
Swiss	7	2	8		17
Italians		7	11	4	22
Roumanians	6	29	10	3	48
Syrians		1	1		2
Germans	6	11	22	1	40
Austro-Hungarians	309	219	166	18	712
Hollanders	5	7	11		23
Danes (other than Icelanders)	6	18	20		44
Icelanders	12	5	2		19
Swedes	34	79	48	12	173
Norwegians	20	74	61	4	159
Russians other than Finns	39	77	49	3	168
Finns	22	6	12		40
Servians					
Bulgarians					
Chinese		2			2
Japanese					
Persians					
Australians		1		1	2
New Zealanders			2	1	3
Hindoos					
Greeks		1	2		3
Poles	20	28	16	1	65
South Americans			2		2
South Africans			1		1
Armenians	1				1
Total	1,488	2,733	2,928	200	7,349

Number of souls represented by above entries, 15,573.

SESSIONAL PAPER No. 12

STATEMENT I—Number of Homestead Entries made in the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia during the fiscal year 1921-22 by persons coming from the United States of America

States	Provinces				Total
	Manitoba	Saskatchewan	Alberta	British Columbia	
Alabama		1	2		3
Alaska					
Arizona					
Arkansas	1	1	4		6
California		3	14	1	18
Carolina, North			5	1	6
Carolina, South		1	3		4
Colorado			9		9
Columbia, District of			1		1
Connecticut	1	2	2	1	6
Dakota, North	30	76	58		164
Dakota, South	1	35	35	2	73
Delaware		1			1
Florida					
Georgia	1	1	2		4
Idaho		5	17		22
Illinois	4	12	33		49
Indiana	3	16	15		34
Indian Territory		3	5		8
Iowa	5	33	47	1	86
Kansas	2	9	22		33
Kentucky	4	9	7		20
Louisiana		1			1
Maine		2	4		6
Maryland		2			2
Massachusetts	3	12	10		25
Michigan	7	41	53	2	103
Minnesota	26	151	107	1	285
Mississippi		3	1		4
Missouri	4	22	36		62
Montana		13	39		52
Nebraska	3	19	30		52
Nevada					
New Hampshire			2		2
New Jersey		2	1		3
New Mexico					
New York	6	9	34	1	50
Ohio	5	12	18	1	36
Oklahoma		5	9		14
Oregon	1	3	24	1	29
Pennsylvania		6	14		20
Rhode Island	1	3	2		6
Tennessee		2	4		6
Texas		5	10		15
Utah			5		5
Vermont	2	2	3		7
Virginia	3	4	6		13
Virginia, West	1	2	5		8
Washington	2	4	40		46
Wisconsin	17	34	36	3	90
Wyoming		..	16		16
Total	133	567	790	15	1,505

STATEMENT J—Number of Homestead Entries made during the fiscal year as compared with the previous fiscal year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	
Battleford			343	367					
Calgary					341	280			
Dauphin	611	358							
Edmonton					1,664	1,297			
Grande Prairie					312	548			
Kamloops							111	71	
Lethbridge					149	78			
Moose Jaw			334	240					
New Westminster							41	44	
Peace River					462	671			
Prince Albert			1,228	674					
Revelstoke							48	5	
Saskatoon			548	163					
Swift Current			280	226					
Winnipeg	877	367							
Fiscal year 1921-22									7,349
Fiscal year 1920-21									5,389
Increase									1,960
Total	1,488	725	2,733	1,670	2,928	2,874	200	120	

RECAPITULATION

Month	Manitoba		Saskatchewan		Alberta		British Columbia	
	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21
April	83	90	149	130	251	192	16	11
May	355	59	625	144	447	316	34	11
June	170	86	329	207	385	356	24	10
July	160	83	326	253	357	332	17	11
August	146	64	275	191	311	297	20	13
September	122	61	183	129	198	254	12	10
October	126	73	225	123	287	271	19	7
November	138	61	242	151	241	237	20	4
December	74	45	147	114	154	214	9	10
January, 1922	45	32	87	77	83	124	7	4
February, 1922	25	27	62	79	92	120	6	11
March, 1922	44	44	83	72	122	161	16	18
Total	1,488	725	2,733	1,670	2,928	2,874	200	120

SESSIONAL PAPER No. 12

STATEMENT K—Number of Soldier Grant Entries made during the fiscal year 1921-22 as compared with the previous fiscal year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	
Battleford			95	218					
Calgary					80	212			
Dauphin	214	185							
Edmonton					302	189			
Grande Prairie					96	209			
Kamloops							18	38	
Lethbridge					27	73			
Moose Jaw			42	153					
New Westminster							43	12	
Peace River					109	188			
Prince Albert			298	467					
Revelstoke							7	8	
Saskatoon			79	166					
Swift Current			76	184					
Winnipeg	169	290							
Fiscal years 1920-21									2,892
Fiscal year 1921-22									1,655
Net Decrease									
Total	383	475	590	1,188	614	1,171	68	58	1,237

RECAPITULATION

Month	Manitoba		Saskatchewan		Alberta		British Columbia	
	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21	1921-22	1920-21
April	200	56	105	127	88	144	41	4
May	32	56	88	120	91	155	5	8
June	25	65	69	162	75	138	0	10
July	26	60	74	191	81	109	6	5
August	22	36	106	120	67	118	5	2
September	18	44	34	86	31	90	0	4
October	20	35	17	87	52	93	1	5
November	16	26	41	88	46	96	3	4
December	6	33	15	65	21	77	2	5
January	5	26	14	49	29	54	2	0
February	6	13	14	39	12	41	1	5
March	7	25	13	54	21	56	2	6
Total	383	475	590	1,188	614	1,171	68	58

STATEMENT L—Number of Letters Patent issued by the Department of the Interior for Dominion Lands since 1873, and the number of acres patented

Period	Number of patents issued	Acreage
1873, May to December 31	420	67,200
1874, January 1 to December 31	577	92,320
1875, January 1 to October 31	464	74,240
1876, year ended October 31	318	50,880
1877, " "	2,437	478,840
1878, " "	2,357	462,880
1879, " "	2,663	426,080
1880, " "	1,084	173,440
1881, " "	1,885	400,862
1882, " "	2,197	506,785
1883, " "	4,341	831,341
1884, " "	3,896	909,604
1885, " "	3,533	898,464
1886, " "	4,570	942,055
1887, " "	4,599	1,071,364
1888, " "	3,275	647,644
1889, " "	3,282	661,636
1890, " "	3,273	626,019
1891, " "	2,479	411,073
1892, " "	2,955	549,257
1893, " "	2,936	502,601
1894, " "	2,553	420,238
1894, November and December	413	66,102
1895, Year ended December 31	2,118	348,964
1896, " "	2,665	531,861
1897, " "	2,972	499,859
1898, " "	3,037	646,671
1899, " "	3,904	714,748
1900, January 1 to June 30	1,970	310,501
1901, Year ended June 30	6,461	6,846,857
1902, " "	8,768	4,711,104
1903, " "	7,349	3,266,388
1904, " "	6,890	2,982,579
1905, " "	8,798	6,197,354
1906, " "	12,370	4,181,345
1906, July 1 to March 31, 1907	10,596	2,361,330
1908, Year ended March 31	18,690	6,138,977
1909, " "	22,431	4,215,326
1910, " "	22,854	3,662,259
1911, " "	21,754	3,710,288
1912, " "	19,354	3,155,388
1913, " "	24,965	4,209,388
1914, " "	31,053	5,192,141
1915, " "	24,260	3,996,013
1916, " "	18,989	3,089,636
1917, " "	18,774	3,019,178
1918, " "	23,227	3,721,632
1919, " "	16,810	3,063,383
1920, " "	7,732	2,785,830
1921, " "	17,947	2,753,494
1922, " "	13,116	2,024,938
	446,331	99,607,938

SESSIONAL PAPER No. 12

REPORT OF THE CONTROLLER OF SCHOOL LANDS, W. T. ROLLINS

Owing to the prevailing financial depression, no school lands were offered for sale by public auction during the fiscal year. A considerable area, however, was disposed of by private sale as shown by the following statements:—

MANITOBA

How disposed of	Area	Value	Average Per acre
Soldier Settlement Board	4,034·66	$ 41,235 24	$ 10 22
Railway companies	23·35	260 50	11 16
School sites	7·00	70 00	10 00
Total	4,065·01	$ 41,565 74	$ 10 22

SASKATCHEWAN

How disposed of	Area	Value	Average Per acre
Soldier Settlement Board	35,121·30	$ 472,485 09	$ 13 45
Railway companies	85·02	1,402 19	16 49
School sites	3·04	30 40	10 00
Dried-up areas	131·30	1,113 50	8 48
Total	35,340·66	$ 475,031 18	$ 13 44

ALBERTA

How disposed of	Area	Value	Average Per acre
Soldier Settlement Board	4,924·11	$ 74,994 79	$ 15 23
Railway companies	36·37	544 48	14 97
School sites	25·00	258 15	10 33
Town lot		200 00	.....
Total	4,985·48	$ 75,997 42	$ 15 24

The following statement shows the approximate area of school lands disposed of down to March 31, 1922, after making deductions for cancelled sales, etc.:—

Province	Area Acres	Value	Average
Manitoba	664,218·57	$ 6,425,600 75	$ 9 67
Saskatchewan	1,511,097·80	26,450,429 55	17 50
Alberta	952,164·94	13,161,415 19	13 82

The value of town lots disposed of to March 31, 1922, was as follows:—

Manitoba	$ 4,803 40
Saskatchewan	13,291 00
Alberta	39,880 00

The number of permits and leases issued, the number of leases in good standing, and the combined revenue derived therefrom for the three provinces to March 31, 1922, was as follows:—

	Permits issued	Leases issued	Leases in good standing	Revenue derived
Grazing	6,692	....	....	$104,741 23
Coal	....	....	78	28,949 06
Petroleum and gas	....	389	628	32,411 31
Hay	3,667	3	22	10,209 72
Cultivation	198	....	....	4,237 48
Timber	191	....	....	9,452 72
Special	....	....	15	1,040 62

Registration Fees—The revenue derived from the registration of 420 assignments for the three provinces amounted to $1,202.85.

The total net revenue collected for the fiscal year was as follows:—

Manitoba	$ 203,795 51
Saskatchewan	1,475,299 55
Alberta	602,688 53
Total	$2,281,783 59

The revenue collected for the fiscal year, less principal moneys and less expenditure, was paid over to the Governments of the provinces of Manitoba, Saskatchewan, and Alberta, as follows:—

Manitoba—	
Revenue other than principal moneys	$ 65,494 08
Less expenditure	16,292 16
Amount paid to province	$ 49,201 92
Saskatchewan—	
Revenue other than principal moneys	$433,195 70
Less expenditure	49,947 00
Amount paid to province	$383,248 70
Alberta—	
Revenue other than principal moneys	$290,782 97
Less expenditure	34,633 36
Amount paid to province	$256,149 61

The balance standing to the credit of the School Lands Fund for each province as on March 31, 1922, was as follows:—

Manitoba—	
Total amount at credit of fund	$ 5,635,839 74
Amount invested in debenture stock	5,635,000 00
Balance of fund uninvested	$ 839 74
Saskatchewan	
Total amount at credit of fund	$12,027,514 84
Amount invested in debenture stock	12,027,000 00
Balance of fund uninvested	$ 514 84
Alberta—	
Total amount at credit of fund	$ 6,471,051 94
Amount invested in debenture stock	6,471,000 00
Balance of fund uninvested	$ 51 94

Statements herewith lettered A, B and C, respectively, show the revenue collected from each of the provinces of Manitoba, Saskatchewan, and Alberta, duly classified.

Statements herewith lettered D, E and F, respectively, show the balance standing to the credit of the School Lands Fund for each province as on March 31, 1922, after deducting amounts invested in Dominion of Canada debenture stock, as provided for by order in council dated December 1, 1919.

STATEMENT A—Manitoba School Lands—Revenue collected for the fiscal year 1921-22

	Sales		Total	Cultivation	Grazing rent	Timber	Hay	Coal	Petroleum and Natural gas	Registration fees	Miscellaneous	Total
	Principal	Interest										
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Total	146,357 00	53,006 13	199,363 13	719 50	3,867 83	4,803 54	3,254 27	5 00	1,531 39	8 00	36 00	213,588 66
Registration fees transferred from Dominion Lands										163 00		163 00
Total	146,357 00	53,006 13	199,363 13	719 50	3,867 83	4,803 54	3,254 27	5 00	1,531 39	171 00	36 00	213,751 66
Office fees transferred to Dominion Lands						75 75	461 50					537 25
Total	146,357 00	53,006 13	199,363 13	719 50	3,867 83	4,727 79	2,792 77	5 00	1,531 39	171 00	36 00	213,214 41
Refunds	8,055 57	126 97	8,182 54	177 50	418 38	242 60	157 88		240 00			9,418 90
Total	138,301 45	52,879 16	191,180 59	542 00	3,449 45	4,485 19	2,634 89	5 00	1,291 39	171 00	36 00	203,795 51

STATEMENT B—Saskatchewan School Lands—Revenue collected for the fiscal year 1921-22

	Sales		Total	Cultivation	Grazing rent	Timber	Hay	Coal	Petroleum and Natural gas	Registration fees	Miscellaneous	Total
	Principal	Interest										
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ ct
Total	1,071,059 95	361,667 12	1,432,727 07	3,557 25	62,729 86	837 41	5,917 37	3,673 53	1,144 30	34 00	1,118 54	1,511,739 33
Registration fees transferred from Dominion Lands										188 65		188 65
Total	1,071,059 95	361,667 12	1,432,727 07	3,557 25	62,729 86	837 41	5,917 37	3,673 53	1,144 30	522 65	1,118 54	1,512,227 98
Office fees transferred to Dominion Land						54 77	880 70					935 47
Total	1,071,059 95	361,667 12	1,432,727 07	3,557 25	62,729 86	782 64	5,036 87	3,673 53	1,144 30	522 65	1,118 54	1,511,292 73
Refunds	28,956 10	1,866 95	30,823 05	215 00	4,666 65	10 50	162 20	35 00	58 95		21 73	35,993 18
Total	1,042,103 85	359,800 17	1,401,904 02	3,342 25	58,063 21	772 14	4,874 67	3,638 53	1,085 35	522 65	1,096 81	1,475,299 55

STATEMENT C—Alberta School Lands—Revenue collected for the fiscal year 1921-22

	Sales		Total	Cultivation	Grazing rent	Timber	Hay	Coal	Petroleum and natural gas	Registration fees	Miscellaneous	Total
	Principal	Interest										
	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts	$ cts
Total.	313,363 01	185,190 47	498,553 48	353 23	47,113 96	4,521 78	3,666 56	25,474 77	31,261 93	66 00	189 28	611,200 99
Registration fees transferred from Dominion Lands	.	. . . .						. .		551 20	.	551 20
Total.	313,363 01	185,190 47	498,553 48	353 23	47,113 96	4,521 78	3,666 56	25,474 77	31,261 93	617 20	189 28	611,752 19
Office fees transferred to Dominion Lands	. .	. . . . .	.	.		41 00	491 50	. . . .		.		532 50
Total. .	313,363 01	185,190 47	498,553 48	353 23	47,113 96	4,480 78	3,175 06	25,474 77	31,261 93	617 20	189 28	611,219 69
Refunds	1,457 45	1,030 57	2,488 02		3,885 39	285 41	474 80	169 25	1,227 36		93	8,731 16
Total.	311,905 56	184,159 90	496,065 46	353 23	43,228 57	4,195 37	2,700 26	25,305 52	30,034 57	617 20	188 35	602,488 53

STATEMENT D—Manitoba School Lands—Revenue and Expenditure on account of

Particulars	Period	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1921			538 31
" sales	12 months ended March 31, 1922.		191,180 59
" cultivation permits	" " "		542 00
" timber dues, hay permits, grazing rental, coal, petroleum and miscellaneous	"		11,901 92
" registration fees	"		171 00
" interest on fund	"		1,261 31
To cost of management at Ottawa	"	11,743 22	
" salaries, printing and advertising and general expenses	"	4,518 94	
" revenue and interest paid to Manitoba Government	"	49,201 92	
" interest on fund paid to Manitoba Government	"	1,261 31	
" investments in 5 per cent debenture bonds	"	138,000 00	
" balance March 31, 1922	"	839 74	
		205,595 13	205,595 13

NOTE.—Balance at credit of Manitoba School Lands Fund on March 31, 1922, was $5,635,839.74 of which $5,635,000.00 is invested in 5 per cent Dominion of Canada debenture stock, maturing October 1, 1922, as per Order in Council of December 1, 1919. Interest paid on investment for fiscal year 1921-22 totalled $276,935.62.

STATEMENT E—Saskatchewan School Lands—Revenue and Expenditure on account of

Particulars	Period	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1921			1,410 99
" sales	12 months ended March 31, 1922.		1,401,904 02
" cultivation permits	" " "		3,342 25
" timber dues, hay permits, grazing rental, coal, petroleum and miscellaneous	"		69,530 63
" registration fees	"		522 65
" interest on fund	"		8,545 96
To cost of management at Ottawa	"	35,229 64	
" salaries, printing, advertising and general expenses	"	14,717 36	
" revenue and interest paid to Saskatchewan Government	" " "	383,248 70	
" interest on fund paid to Saskatchewan Government	" " "	8,545 96	
" investments in 5 per cent debenture bonds	"	1,043,000 00	
" balance March 31, 1922	"	514 84	
		1,485,256 50	1,485,256 50

NOTE.—Balance at credit of Saskatchewan School Lands Fund on March 31, 1922 was $12,027,514 84 of which $12,027,000 00 is invested in 5 per cent debenture stock maturing October 1, 1922, as per Order in Council of December 1, 1919. Interest paid on investments for fiscal year 1921-22 totalled $565,251.30.

STATEMENT F—Alberta School Lands—Revenue and Expenditure on account of

Particulars	Period	Dr.	Cr.
		$ cts.	$ cts.
By balance on April 1, 1921			146 38
" sales	12 months ended March 31, 1922.		496,065 46
" cultivation permits	" "		353 23
" timber dues, hay permits, grazing rental, coal, petroleum and miscellaneous	" "		105,652 64
" registration fees	" "		617 20
" interest on fund	" "		4,069 23
To cost of management at Ottawa	" "	23,486 43	
" salaries, printing, advertising and general expenses	" "	11,146 93	
" revenue and interest paid to Alberta Government	" "	236,149 61	
" interest on fund paid to Alberta Government	" "	4,069 23	
" investments in 5 per cent debenture bonds	" "	312,000 00	
" balance March 31, 1922		51 94	
		606,904 14	606,904 14

NOTE.—Balance at credit of Alberta Schools Lands Fund on March 31, 1922 was $6,471,051.94 of which $6,471,000 00 is invested in 5 per cent debenture stock maturing October 1, 1922 as per Order in Council of December 1, 1919. Interest paid on investments for fiscal year 1921-22 totalled $313,170.27.

REPORT OF THE SUPERINTENDENT, MINING LANDS AND YUKON BRANCH, H. H. ROWATT

The total revenue of this branch, derived from all sources during the fiscal year 1921-22, amounts to $1,049,089.24. There is a decrease in the revenue of the branch, amounting to $166,066.87. This is partly due to an amendment to the Petroleum and Natural Gas Regulations, under the provisions of which lessees who incur an expenditure in drilling operations in excess of that which might be applied to the payment of the accrued rental due on the leases affected, may obtain credit for a portion of such excess expenditure and may apply such credit to the payment of the rental of other petroleum locations acquired by such lessees.

Statements lettered A and B, showing in different forms how the revenue is made up, will be found at the end of this report. The statement lettered A shows the total revenue, and the statement lettered B shows the revenue collected at each agency, including the Yukon Territory.

The revenue from the Yukon Territory for the year amounts to $97,176.10, an increase of $6,139.97 over the previous year.

The reports and statements for the fiscal year from the Gold Commissioner and the Crown Timber and Land Agent at Dawson, in the Yukon Territory, also the report of the Inspecting Engineer of Mines, are submitted.

PETROLEUM AND NATURAL GAS

There are now in force under the regulations 7,279 petroleum and natural gas leases, embracing a total area of 2,260,840·74 acres, distributed as follows: In Manitoba, 254 leases, comprising 42,673·05 acres; in Saskatchewan, 335 leases, comprising 141,657·20 acres; in Alberta, 5,097 leases; comprising 1,681,006·30 acres; in British Columbia, 1,393 leases, comprising 242,389·21 acres; and in the Northwest Territories, 200 leases, comprising 153,114·98 acres, and 126 permits, comprising 194,273·62 acres. The total area under lease and permit in the Northwest Territories is 347,388·60 acres. The total revenue derived from petroleum lands during the year amounts to $487,983.67.

Natural gas, which has been discovered in large quantities, is being utilized for domestic and industrial purposes in different parts of the province of Alberta. Oil in small quantities has been discovered in different parts of the province of Alberta and in the Northwest Territories, and drilling operations with a view to further discoveries are being diligently prosecuted in different parts of the provinces of Alberta, Saskatchewan, and Manitoba, as well as in the Northwest Territories. Oil in what would appear to be commercial quantity is reported to have been discovered in the state of Montana near the international boundary, and as a result a large number of petroleum leases have been acquired in southern Alberta as near to the point of discovery as possible, and intensive drilling operations are in immediate contemplation.

The department maintains a technical staff of officers at Calgary, who have been furnished with appliances necessary to close petroleum and natural gas wells which are beyond the control of the operators, owing to the release of gas and water under intense pressure. Reference is made to the work of this staff in the report of the inspecting engineer.

COAL MINING LANDS

Regulations for the sale of coal mining lands were withdrawn a number of years ago and all sales made under the provisions of such regulations have now been completed. The total amount of revenue collected from the sale of coal mining lands was $1,565,632.08.

COAL LEASES

The total number of coal mining leases in force at the close of the fiscal year was 773, comprising a total area of 341,758·08 acres, distributed as follows: In Manitoba, one lease, comprising 40 acres; in Alberta, 673 leases, comprising 332,122·23 acres; in Saskatchewan, 97 leases, comprising 7,625·85 acres; in British Columbia, no lease, comprising 1,930 acres; and in the Yukon Territory, one lease, comprising 40 acres.

The total number of coal mining leases issued during the year was 220, comprising 102,552·89 acres. The total revenue collected during the year for rental of coal mining rights was $209,275·21.

ROYALTY ON COAL

Under the regulations governing the issue of leases to mine coal, the royalty is fixed at five cents per ton of 2,000 pounds on the merchantable output of the mine.

The following is a statement showing the amount collected on account of royalty on coal mined from lands in the western provinces, the Northwest Territories, and the Yukon Territory, respectively, during each year since the regulations came into effect:—

Year	Alberta	Saskatchewan	British Columbia	Yukon	Northwest Territories
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1903-04	56 90	Nil.	Nil.	22 40	Nil.
1904-05	2,822 00	110 70	"	47 00	"
1905-06	2,379 75	47 10	"	569 33	"
1906-07	3,865 26	74 20	"	517 34	"
1907-08	7,621 67	4 30	"	1,543 38	"
1908-09	5,322 39	358 11	"	371 73	"
1909-10	153,559 98	1,672 50	3 00	136 38	"
1910-11	218,932 88	2,184 74	3 50	125 00	"
1911-12	104,894 55	2,034 74	2 78	390 00	"
1912-13	142,997 79	3,145 72	6 95	1,069 11	"
1913-14	147,198 75	2,123 43	19 35	Nil.	"
1914-15	104,489 77	1,880 06	4 90	"	"
1915-16	67,190 17	2,601 52	3 50	"	5 10
1916-17	149,447 82	2,228 08	8 92	"	Nil.
1917-18	144,634 75	1,046 55	Nil.	"	"
1918-19	175,687 66	3,193 05	"	"	Nil.
1919-20	181,641 80	2,573 32	"	"	"
1920-21	190,545 80	2,703 41	"	"	"
1921-22	185,436 88	3,309 86	"	"	"

By an Order in Council dated March 16, 1918, provision was made that, owing to the scarcity of fuel in the Yukon Territory, no royalty shall be levied or collected on coal mined in that territory for a period of five years; that is, up to April 7, 1923.

The total revenue derived from coal mining lands on account of purchase price, rental, royalty, and application fees, during the fiscal year, amounted to $402,751.21.

QUARTZ AND PLACER MINING CLAIMS

During the fiscal year 1,468 entries for quartz and 975 entries for placer mining claims were granted by the mining recorders in Manitoba, Saskatchewan, and Alberta, and by the mining recorder for the Northwest Territories. The total revenue received from rentals of quartz mining leases and fees in connection with mineral claims was $37,545.88.

The total revenue received for fees in connection with the administration of the Placer Mining Regulations relating to lands outside of the Yukon Territory was $9,750.

According to the returns from the Yukon Territory during the fiscal year 83 entries for placer mining claims and 2,647 renewals were recorded. The revenue from these sources and from fees for registering documents in connection with mining properties was $46,147.75.

Very satisfactory results appear to have been obtained from a shipment of 2,200 tons of silver-lead ore from the Keno Hill district, in the Yukon Territory, notwithstanding the fact that the cost for the production, transportation, and treatment of such ore amounted to nearly one hundred dollars per ton.

QUARRYING

The number of leases now in force, issued under the provisions of the regulations, is 245, distributed as follows: In Manitoba, 89 leases, comprising 2,681·97 acres: in Saskatchewan, 28 leases, comprising 845·77 acres; in Alberta, 94 leases, comprising 4,145·30 acres; and in British Columbia, 34 leases, comprising 838·98 acres.

The total revenue collected during the fiscal year on account of quarrying and clay leases, including the application fees, amounts to $7,771.93.

POTASH

Under the provisions of the regulations for the disposal of potash rights, the property of the Crown, 45 leases in all were issued, of which number only five leases, comprising an area of 3,082 acres, are now in good standing. The revenue derived from this source during the year was $245.

ALKALI

By an Order in Council dated April 20, 1921, regulations were established for the disposal of all natural accumulations of soluble mineral salts and associated marls, the property of the Crown, in the western provinces and territories. Under these regulations 10 leases have been granted, comprising a total area of 3,266·18 acres, and the revenue derived from the issue of such leases amounts to $1,221.25.

ROYALTY ON GOLD MINED IN THE YUKON TERRITORY

The total amount collected up to March 31, 1922, for royalty on gold, the output of placer mining claims in the Yukon Territory, after deducting the exemption at one time allowed under the regulations, was $4,816,847.27, of which amount $30,774.05 was collected during the last fiscal year. For the purpose of estimating royalty, the gold is valued at $15 an ounce, which is much below its real value.

The actual value of gold produced from placer mining operations in the Yukon Territory, up to March 31 last, might be safely placed at $160,000,000.

DREDGING

Nine leases to dredge for minerals in the beds of rivers in the Yukon Territory are now in force, including a total river stretch of 38·43 miles. The total revenue derived from this source up to March 31, 1922, amounts to $201,387.12, of which amount $168.30 was collected during the fiscal year just closed.

These dredging leases comprise portions of the Yukon, Fortymile, and Klondike rivers.

For the purpose of gold recovery, there are at present six dredges engaged in mining in the Yukon Territory, all of which are being operated by hydro-electric motive power. Two of these dredges are of large capacity, capable of excavating and treating 15,000 cubic yards of gravel per day.

Twenty-nine leases to dredge for minerals in the submerged beds of rivers in the provinces of Manitoba, Saskatchewan, and Alberta are now in force, covering a total frontage of 134 miles. Of these leases, twenty-three are in Alberta and include 111 miles, five in Saskatchewan, including eighteen miles, and one in Manitoba, including five miles. The total revenue derived from this source up to March 31, 1922, amounts to $50,727.47, of which amount $2,092 was collected during the past fiscal year.

HYDRAULIC MINING

The regulations for the disposal of hydraulic mining locations in the Yukon Territory were withdrawn by an Order in Council dated February 4, 1904. The leases then in force were not affected by such withdrawal.

There are still six hydraulic mining locations held under leases comprising a total area of 15·03 square miles.

Rentals, amounting to $155,801.08 have been collected on account of such locations and the amount paid on this account during the fiscal year was $2,569.

TIMBER IN THE YUKON TERRITORY

The total amount of dues collected on account of timber cut in the Yukon Territory during the fiscal year was $9,991.79. One hundred and thirty-eight permits were issued during the year under the authority of which 16,164 cords of wood were cut, the dues on which amounted to $8,812.06.

There are in existence seventy-six timber berths, held under license to cut timber within the territory, covering an area of 164·75 square miles, which licenses were granted prior to May 10, 1906, on which date the regulations governing the granting of such licenses were rescinded, and regulations for the issue of permits were substituted therefor.

The quantity of lumber manufactured from timber cut under license during the year and sold was 1,282½ feet, board measure, and the number of cords of wood cut was 1,220, from which a revenue of $9,991.79 was derived. Seizure dues, amounting to $568.35 were collected on 1,072·71 cords of wood cut in trespass. This does not include the very large amount of timber and cordwood cut free of dues for mining purposes.

WATER RIGHTS

There are now in force in the Yukon Territory 488 grants to divert water for mining purposes under the provisions of the Yukon Placer Mining Act, aggregating a total of 120,445 miner's inches. During the last fiscal year no water rights were issued.

HOMESTEADS IN THE YUKON TERRITORY

One hundred and six homestead entries have been granted in the Yukon Territory, of which fifty-nine are now in force, comprising a total area of 8,970·56 acres. Patents have been issued for sixteen homesteads.

DOMINION LANDS REVENUE—MINING LANDS AND YUKON BRANCH

STATEMENT A—Revenue obtained from coal and other minerals disposed of in the western provinces and territories, also collections made on account of timber, etc., for the fiscal year:—

	$ cts.		$ cts.
Quartz acreage sales	[illegible] 64	Free certificates, export of gold	4 50
Dominion lands sales	1,664 16	Stone quarry	7,771 93
Coal lands sales	472 76	Registration and office fees	1,004 80
Coal mining	4,256 50	Homestead fees	20 00
Coal royalty	188,746 74	Hay, Yukon	22 40
Coal rental	209,275 21	Interim receipt account	132 50
Rental, Yukon	5,419 78	Tar sands	960 00
Timber dues, Yukon	9,991 79	Sand stone and gravel	30 00
Mining fees	93,333 63	Petroleum	487,983 67
Hydraulic leases	2,569 00	Potash	245 00
Dredging leases, Western Provinces	2,032 00	Quartz rental	110 00
		Rent of equipment	300 00
Dredging leases Yukon	168 30	Gypsum	55 00
Gold export tax	30,774 68	Alkali	1,221 25
Amber lease	238 00	Miscellaneous	11 00

STATEMENT B—Total amount of revenue collected at each agency, including the Yukon Territory, for the fiscal year:—

	$ cts.		$ cts.
Battleford	1,224 48	Swift Current	6,610 83
Calgary	239,331 01	Fort Smith, N.W.T.	104,594 40
Dauphin	12,896 43	Winnipeg	17,350 32
Edmonton	215,142 72	Dawson, Gold Commissioner's Office	47,440 36
Grande Prairie	30,454 77	Dawson, Crown Timber Office	8,815 69
Kamloops	743 55	Dawson, Royalty C. Office	30,714 84
Lethbridge	166,164 14	Dawson, Comp. Office	4 50
Moose Jaw	9,996 22	Dawson, Dominion Lands	4,465 22
New Westminster	56,446 33	Whitehorse, Min. Rec.	1,763 43
The Pas, Manitoba	15,763 80	Whitehorse, Crown Timber Office	1,198 50
The Pas, Saskatchewan	4,236 75	Whitehorse, Royalty Collector's Office	59 84
Peace River	60,384 51	Whitehorse, Dom. L. Office	2,713 72
Prince Albert	8,962 80		
Revelstoke	524 40		
Saskatoon	1,085 68		

REPORT OF THE GOLD COMMISSIONER AND CROWN TIMBER AND LAND AGENT, DAWSON

The revenue from the Gold Commissioner's office and Crown Timber and Land Agent's offices for the year was $59,971.27, exclusive of rentals paid direct to the department at Ottawa. This is an increase of $8,103.54 over last year.

PLACER GOLD MINING

The export tax was paid on 82,065.79 ounces of gold during the year, which for practical purposes may be considered the amount mined. The past summer was the the driest of which there is any record in the history of the camp, and the consequent shortage of water seriously affected the output, especially from the hydraulic mines.

YUKON GOLD COMPANY

This company's operations were on a slightly reduced scale compared to the previous year chiefly on account of the shortage of water referred to, and also on account of a shortage of labour. One dredge was in operation on Gold Run creek during a dredging season of 138 days from May 17 to October 2. A total of 556,957 cubic yards of material was handled by this dredge.

Ten hydraulic mines were operated at the following points: Oro Fino Hill, Lovett Hosford, Cheechaco Hill, Fox Gulch, Jackson Gulch, Adams Hill, Monte Cristo, Gold Hill, American Gulch, Trail Gulch. A total of 1,069,168 cubic yards was washed.

The hydro-electric power plant of the company on the Twelve-mile river was operated and furnished throughout the season an adequate supply of power. The daily average of men employed during the mining season (April to October) was as follows: hydraulic mines, 54; dredges and thawing, 47; ditch, 24; otherwise employed, 43; total, 168.

BURRELL AND BAIRD, LIMITED

This company, the successor to the Canadian Klondike Mining Company, Limited, operated dredges Canadian Nos. 2 and 4 in the Klondike Valley on Hydraulic Mining Leasehold No. 18, and Dredging Leasehold No. 24. No. 2 Dredge operated from May 10 to November 30 and handled 1,539,795 cubic yards. No. 4 operated from May 12 to November 7 and handled 1,245,000 cubic yards. An average of sixty men were employed by this company.

The pumping plant of the company near the mouth of Hunker creek was in operation from May 10 to September 19 and furnished 500 inches of water, which was used by Mr. M. H. Jones in his hydraulic operations on Last Chance creek.

THE NEW NORTH WEST CORPORATION, LIMITED

This company is the successor of The North West Corporation, Limited, and is the holder of 1,020 placer claims on creeks in the Indian river watershed. A dredge of $7\frac{1}{2}$ cu. ft. capacity was operated on Nos. 13-A to 20 Below Lower Discovery on Dominion Creek and 393,700 cubic yards of material were dredged. Their No. 2 Dredge referred to in my report last year as being installed on Lower Dominion Creek, was made ready for digging on August 1 and during the remainder of the season handled 342,930 cubic yards of material.

The cold water thawing process referred to in my former reports has proved a complete success, but supplementary steam plants are found necessary during the early months of the season. An average of 112 men was employed by this company.

TITUS DREDGING COMPANY

The dredge operated by this company on Highet creek handled 400,000 cubic yards of material. An average of twenty men was employed in its operation.

OTHER PLACER OPERATIONS

In addition to what may be termed the large scale operations referred to, many individuals and miners working in partnership were engaged in placer mining throughout the various camps of the district. The shortage of water interfered seriously with these operations.

Mr. Nevill A. D. Armstrong and associates carried on extensive prospecting operations on Russell creek, a tributary of the MacMillan river. A Keystone drill was transported to that creek and was in operation a part of the season. The results obtained were satisfactory and further extensive drilling operations will be carried on there this coming season.

LODE MINING

Activity in lode mining has now centred on the silver lead properties on Keno Hill and vicinity. The smelter returns from the ores shipped last year by the Keno Hill, Limited, were very satisfactory, and the same company have now at Mayo,

awaiting shipment on the opening of navigation, over 3,100 tons of high grade ore. In addition to mining this ore they have carried on extensive development work throughout the last year; 1,500 feet of drifts, winzes, and cross-cuts were driven. On the "Sadie" and "Friendship" claims 180 feet of shafts, drifts, and cross-cuts were driven in development work. The men employed were as follows: In the mine, 41; power plant, 4; furnishing wood for plant, 8; transportation, 25.

Mr. F. W. Bradley and associates have acquired extensive interests in the camp and have devoted their energies almost entirely to development work, no attempt being made to mine ores for shipment. Twenty-five men were employed in these operations.

The Slate Creek Mining Company on the "Fisher" and "Rondo" claims, near Lightning creek, have carried on extensive development work on their properties with very satisfactory results.

In general it is safe to say that the work accomplished by the above companies and others during the past year has immeasurably increased the confidence of mining men in the future of the camp.

WOOD, TIMBER, AND COAL

One hundred and fourteen permits to cut wood and timber were issued during the year. The quantity of timber cut under permits during the year on which dues were paid was 343,300 feet, board measure. Number of cords cut under authority of permits during the year was 14,218; number of cords cut without authority of permit on which seizure dues were paid, 1,072; number of feet board measure cut and sold under license during the year, 1,282.

The Five Fingers Coal Company were not able to make satisfactory arrangements with the transportation company to transfer their coal to Dawson, and as a result the local market was not properly supplied. Satisfactory arrangements have, however, been perfected for next season.

AGRICULTURE

The season being exceptionally dry, the crop of hay and grain cut green for fodder was not up to usual standard. The potato crop, however, which is of very considerable importance, was of good quality. The experiment of bringing in seed grain and fertilizer and selling the same to the farmers at cost has been satisfactory and has been much appreciated by the farming community.

HOSPITALS AND PUBLIC HEALTH

The health of the people has been exceptionally good, no epidemics having occurred. St. Mary's Hospital at Dawson has continued to render splendid service, as well as the General Hospital at Whitehorse, each serving their respective territories in a most satisfactory manner.

EDUCATION

Owing to lack of funds it was necessary to reduce the teaching staff in the Dawson Public and High Schools. A fully paid Government school was provided at Mayo.

SESSIONAL PAPER No. 12

LAW AND ORDER

The Royal Canadian Mounted Police have maintained order in their usual efficient manner. Patrols were maintained to outlying creeks at frequent intervals.

Report of Inspecting Engineer of Mines, O. S. Finnie

Largely owing to increased United States competition, unfavourable weather conditions, and general business depression, there was a decrease in the production of coal in Alberta of about 14 per cent during 1921, as compared with the previous year. In Saskatchewan the production was practically the same as in 1920.

For purposes of comparison the schedule below indicates the output from these provinces for the past two years. It is divided into three classes: coal subject to royalty on Dominion lands, coal subject to royalty on School lands, and coal not subject to royalty.

Province	Calendar year	Output subject to royalty		Not subject to royalty	Total
		Dominion lands	School lands		
		Tons	Tons	Tons	Tons
Alberta	1920	3,631,672	523,318	2,752,773	6,904,935
Saskatchewan	1920	41,798	45,952	247,372	346,328
Alberta	1921	3,282,838	312,962	2,331,470	5,927,270
Saskatchewan	1921	46,142	48,480	247,190	341,812

The following schedule shows the number of mines in Alberta and Saskatchewan during the years, 1920 and 1921, subject to royalty on Dominion and School Lands and those not subject to royalty, also the total number operated in each year.

Province	Calendar year	Number of operating coal mines subject to royalty		Mines not subject to royalty	Total mines
		Dominion lands	School lands		
		No.	No.	No.	No.
Alberta	1920	177	16	76	269
Saskatchewan	1920	58	10	4	72
Alberta	1921	179	16	76	271
Saskatchewan	1921	57	6	15	78

It will be noted that there was a reduction of output in Alberta of nearly one million tons. The decrease in the different fields was approximately as follows: Taber field, 67 per cent; Lethbridge field, 8 per cent; Crowsnest pass, 28 per cent; Drumheller field, 18 per cent; Brazeau field, 5 per cent.

The mines in southern Alberta, including those in the Taber, Lethbridge, and Drumheller fields, were inspected during the year.

There was a considerable amount of development work in the Sheep Creek area, but owing to lack of transportation facilities no coal was shipped out.

At the end of the fiscal year, Mr. J. W. McIntosh, one of the mining inspectors stationed at Calgary, retired. On May 1, 1921, Mr. R. J. Lee was appointed a mining inspector and assigned to duty in Saskatchewan, with headquarters at Estevan.

All the operating mines in Saskatchewan were inspected and thirty-four surveys were made. Experiments were conducted for the purpose of determining what steam power could be generated from Souris lignite. It is hoped that the results obtained will be the means of creating a greater demand for Saskatchewan coal.

During the year the petroleum engineer's division was called upon to render advice and assistance to numerous operators in addition to the routine inspections and reports.

The petroleum engineer himself made an extended inspection in the Northwest Territories and Vancouver fields, while the petroleum and natural gas inspector in addition to assisting with the usual inspections was engaged in superintending the mudding and cementing operations at Peace River well No. 2, also repairing defective gas wells at Medicine Hat.

The following special undertakings were completed:—

1 A system of graphic well logs built of strips of wood.
2 A peg model of the Peace River field.
3 A relief model of the Turner Valley oil field.
4 A map showing the gas fields of Western Canada.
5 A manual for the use of oil and gas operators.
6 A system for collecting and analysing water samples from oil and gas wells.

PRODUCTION OF NATURAL GAS AND PETROLEUM IN WESTERN CANADA DURING 1921

Natural Gas

Bow Island Gas Field

Canadian Western Natural Gas, Light, Heat and Power Company—2,759,727 cubic feet.

Town of Bow Island—Nominal.

Turner Valley Field

Royalite Company, January to March, 1922—214,370,000 cubic feet.

Southern Alberta Oil Company—Nominal.

Medicine Hat Field

City of Medicine Hat—1,652,191,000 cubic feet.

NOTE—Gas was also produced in the Medicine Hat field by the Redcliff Gas Company, the Ogilvie Flour Mills, the Canadian Pacific Railway, the Alberta Clay Products, and others, but a record of their production is not available.

Wetaskiwin Field—Nominal.

Petroleum

Turner Valley Field

Royalite Company, February, 1921, to March, 1922—30,415 gallons.

Sheep River Oil Company, operating only September to December, 1921—15,015 gallons.

Canada Southern Oil, June to December, 1921—12,005 gallons.

Illinois Alberta Oil Company—Nominal.

Southern Alberta Oil Company, December, 1920, to December, 1921—204,750 gallons.

Alberta Southern Oil Company, December, 1920, to December, 1921—47,250 gallons.

Northwest Territories

Northwest Company at Fort Norman—Nominal.

Natural Gasolene

Turner Valley Field

Royalite Oil Company, February, 1921, to March, 1922—104,689 gallons.

BORING OPERATIONS

Boring operations were commenced on eight petroleum and natural gas leases, during the year 1921-22 and ten bore holes were officially abandoned. One well reported new flows of gas. No new production of oil was reported. Details of operations during year are submitted in the following schedule:—

DETAILS OF OPERATIONS APRIL, 1921-MARCH, 1922

Province	Number drilling during year	Commenced this year	Abandoned this year	Producing gas	Producing oil	—
Alberta	24	5	5	57	6	Does not include gas wells capped
Saskatchewan	3		1			
Manitoba	5		3			
British Columbia	2					Railway Belt only.
Northwest Territories	6	4	1		1	

DETAILS OF OPERATIONS

Northern Alberta

Peace River Field.—Three companies operated during the past year. Two of these met with losses because very heavy flows of water and natural gas were penetrated, and gushing out with great force completely wrecked the surface equipment. There are now eight bore holes in the Peace River field, where the water horizons have not been sealed off and from which large columns of natural gas are being continuously wasted. The department's mudding and cementing equipment was being used at well No. 3 of the Peace River Oil Company during the summer and autumn, and a summary of the operations will be found under another heading.

Pouce Coupé Field.—The Northwest Company were drilling a well on section 26, township 80, range 13, west of the 6th meridian, and reached a depth of 1,730 feet during the year. A flow of 10,627,200 cubic feet of gas per 24 hours was penetrated at a depth of 1,676 feet, and the gauge pressure was found to be 700 pounds to the square inch. Below the gas at a depth of 1,730 feet salt water came into the well and the company found it advisable to temporarily plug off the gas and water with mud fluid, and suspended operations until the spring of 1922.

McMurray Field.—The Alcan Oil Company drilled a well to the depth of 262 feet on section 28, township 96, range 10, west of the 4th meridian, some six miles east of the Athabasca river. The "tar sands" were penetrated immediately below the surface beds and at a depth of 245 feet the sand appeared to contain a more fluid bitumen which slowly seeped into the drill hole. However, the oil was too viscous to either bail or pump of the drill hole. It is the company's intention to prospect further in this district.

Central Alberta

Birch Lake District.—The J. R. Talpey syndicate "spudded in" a well on section 14, township 50, range 12, west of the 4th meridian. A depth of 750 feet was attained before operations were suspended for the winter.

Cow District.—The Northwest Company's bore hole on section 17, township 39, range 7, west of the 4th meridian, which had been drilled to a depth of 3,500 feet, and had penetrated well into the Palaeozoic Limestones, was abandoned as a "dry hole."

Monitor District.—The Talpey Syndicate began a bore hole on section 5, township 35, range 4, west of the 4th meridian.

The West Regent Oil and Gas Company using the only rotary rig in central Alberta on section 19, township 34, range 4, west of the 4th meridian, attained a depth of some 2,000 feet before operations were suspended for the winter.

The Mud Butte Oil Company in section 29, township 32, range 4, west of the 4th meridian, attained a depth of 500 feet with a diamond drill before operations were suspended for the winter.

Misty Hills District.—The Northwest Company drilling in section 24, township 32, range 4, west of the 4th meridian, were delayed most of the year by the destruction of their rig by fire.

Foothills

Coalspur District.—The Northwest Company have recently "spudded in" a well on section 3, township 49, range 21, west of the 5th meridian.

Turner Valley Oil and Gas Field.—After the destruction of some of the equipment of the Calgary Petroleum Products Company, the operations on section 6, township 20, range 2, west of the 5th meridian, were taken over by the Royalite Company. The gasolene absorption plant was reconstructed along more elaborate lines, a compressor plant was installed and a 6-inch pipe line laid from the plant to connect with the Calgary Bow Island line of the Canadian Western Natural Gas, Light, Heat and Power Company. The gas is drawn from wells Nos. 1 and 2 under 6 inches of vacuum into the compressors and is discharged therefrom into the absorption plant at a pressure of 120 pounds per square inch. The gasolene is extracted and the gas, after being metered, is conducted through the 6-inch pipe line to be finally consumed in Calgary. The daily production of gas approximates 2,000,000 cubic feet.

A production of oil is maintained by the Southern Alberta wells Nos. 1 and 2, the Alberta Southern well No. 1, the Canada Southern well No. 1, the Sheep River Oil Company's well No. 1 and the Illinois-Alberta Oil Company's well No. 1.

No. 3 well of the Royalite Company, which is being drilled, is constantly striking new flows of gas.

Willow Creek District.—The Alberta Associated well (Christie No. 1) on section 7, township 16, range 2, west of the 5th meridian, was officially abandoned this year.

The Willow Creek well on section 29, township 14, range 2, west of the 5th meridian, being drilled by the Northwest Company, has been delayed by drilling difficulties.

Pincher Creek District.—Twin Butte well No. 1 of the Northwest Company drilling to a depth of 2,780 feet was abandoned as a dry hole in February, 1922. Twin Butte well No. 2 of the Northwest Company was abandoned in March, 1922, at a depth of 4,370 feet.

Southern Alberta Prairie

Bow Island Gas Field.—This important field, which has been rapidly declining during the past few years, had in November, 1921, an average closed pressure for the working wells of 220 pounds. No new drilling has been undertaken in the field.

Medicine Hat-Redcliff Field.—No new development took place during the year. Pressure tests indicate a decline of 25 to 30 pounds in gas pressure for the year.

Saskatchewan

Drilling operation were conducted in Saskatchewan by the Northwest Company on section 9, township 1, range 27, west of the 3rd meridian, and on section 7, township 39, range 22, west of the 3rd meridian.

The Rush Lake well of the Northwest Company, located on section 30, township 19, range 11, west of the 3rd meridian, was abandoned at a depth of 2,325 feet, as a dry hole.

British Columbia

Inspections were made and reports furnished of drilling operations which were being conducted during the year on the Fraser delta in the vicinity of Vancouver.

Northwest Territories

An investigation was made of the drilling operations in the Northwest Territories. At the time of the inspection (July) the Northwest Company was "rigging up" preparatory to drilling on four locations in the vicinity of Discovery well in the Fort Norman area. The Fort Norman Oil Company had "spudded in" on a lease six miles down stream from Discovery well.

After carefully investigating conditions at the Discovery well the general conclusion arrived at was that the well would probably produce a high grade petroleum at a rate of less than eight barrels per day.

The bore hole at Windy Point on Great Slave lake which was being sunk by the Northwest Company was operating at a depth of 1,300 feet in a salt formation. The well was subsequently abandoned at a depth of 1,806 feet in Lower Palaeozoic measures. No oil or gas was obtained.

MUDDING AND CEMENTING OPERATIONS

At the request of the Canada Cement Company the branch supervised the work of repairing and putting in a tubing and packer in their No. 3 well at Medicine Hat. The work was successfully accomplished and the water which had been seeping into the well was effectively sealed off from the gas sands.

The operations conducted, with a view to ascertaining the advisability of further work, on No. 1 well of the Canada Cement Company at Medicine Hat were also supervised. This work was completed during February, 1921. The department's mudding and cementing equipment had been transferred to Peace River in July last year. Preliminary operations were begun on well No. 3 of the Peace River Oil Company. Owing to the great difficulty and expense that would have attended the shipping of clay suitable for making mud fluid, an attempt was made to cement the well without first killing agitation by mud fluid. It was hoped that the casing was sufficiently tight to prevent any movement of gas in the well. After the operations were completed, it was soon discovered that the attempt at cementing without mud fluid was not successful. As the season was then too short to begin new work, it was decided to suspend operations until the spring of 1922.

REPORT OF THE CONTROLLER, TIMBER AND GRAZING LANDS BRANCH, B. L. YORK

The total revenue derived from timber, grazing, and hay lands during the fiscal year amounted to $723,322.81. This is a decrease of $83,796.12 as compared with the revenue for the previous year, and is the result of the generally adverse conditions.

TIMBER

Statements A, B, and C, showing the total revenue from the timber agencies, and other sources of revenue by agencies, also the statements from the Crown timber agents at Calgary, Edmonton, Prince Albert, Winnipeg, Kamloops, New Westminster, and Revelstoke, showing the revenue collected within their respective agencies, and other information are appended hereto.

The report of the Superintendent of Dominion Timber Agencies, and the report of the inspectors of ranches located at Calgary, Moose Jaw, Prince Albert, and Peace River are also attached.

The revenue from timber, grazing, and hay lands received at the Crown Timber agencies, and also the number of mills operated under license, and the number of mills operated under permit are as follows:—

Agency	Total revenue	Number of mills operating under license	Number of mills operating under permit
	$ cts.		
Calgary	43,019 42	11	16
Edmonton	113,681 24	27	95
Prince Albert	88,766 44	31	51
Winnipeg	136,690 99	27	47
Kamloops	42,796 16	10	—
New Westminster	173,000 38	30	—
Revelstoke	22,396 50	11	—

The returns of operations show the quantity of timber and also other material manufactured and sold under license to be as follows:—

—	Manufactured	Sold
Sawn lumber, feet board measure	188,227,507	200,568,835
Railway ties	307,397	255,090
Laths	25,262,905	30,222,808
Shingles	.....	16,000
Shingle bolts, cords	25,410	27,634
Mine timber, lineal feet	971,623	1,063,917
Piling, lineal feet	82,434	89,979
Mine ties	628	628
Telephone poles	28,036	.....
Cordwood, cords	1,012	974
Lagging, cords	1,245	1,145
Fence posts	115,884	.....
Boom timber, lineal feet	14,579	.....

The total quantity of timber and also other material manufactured and sold under permit and portable saw-mill berths is as follows:—

—	Manufactured	Sold
Sawn lumber, feet board measure	41,972,406	35,680,520
Railway ties	214,492	214,152
Shingles	597,250	581,250
Laths	307,950	282,950
Mine ties, lineal feet	172,065	165,367
Mine timber, lineal feet	3,578,775	2,576,660
Telephone poles	2,232	1,607
[illegible]	44,873	[illegible]
Fence rails	1,168	
Cordwood, cords	2,241	3,128

The area of lands held under license and permit in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia is as follows:—

—	Under license	Under Permit
	sq. miles	sq. miles
Manitoba	991·47	396·05
Saskatchewan	1,042·77	119·37
Alberta	1,835·32	127·04
British Columbia	1,727·68	9·50
	5,597·24	651·96

During the year 91 berths were granted, as follows: 2 license berths, 35 portable saw-mill berths, 38 cordwood berths, 15 permit and firekilled berths, 1 pulpwood berth.

GRAZING

There were 6,518 grazing leases in force, covering an area of 6,341,952 acres, made up as follows: Manitoba, 135,837 acres; Saskatchewan, 2,911,365 acres; Alberta, 2,879,504 acres; British Columbia, 415,246 acres. During the year 581 new leases were issued.

STATEMENT A—Revenue for fiscal year 1921-22

Timber	$573,479 98
Grazing	101,175 22
Hay	18,829 25
Registration fees	278 00
Fire-guarding dues	24,056 76
Improvements	916 70
Scaling fees	4,426 65
Scale books	41 25
License fees	118 00
Sundries	1 00
Total	$723,322 81

STATEMENT B—Revenue from Timber for fiscal year 1921-22

Bonus	$ 20,631 12
Rent	83,339 81
Royalty	216,044 10
Permit fees, dues and rentals	238,497 15
Seizure dues	14,967 80
Scaling fees	4,426 65
Scale books	41 25
License fees	118 00
Total	$578,065 88

STATEMENT C—Revenue from Grazing, Hay, Registration Fees, Improvements and Sundries for fiscal year 1921-22

Grazing	$101,175 22
Hay	18,829 25
Registration fees	278 00
Fireguarding dues	24,056 76
Improvements	916 70
Sundries	1 00
Total	$145,256 93

REPORT OF SUPERINTENDENT OF DOMINION TIMBER AGENCIES, E. F. STEPHENSON

STATEMENT A—Summary of work performed and revenue collected in the respective Crown Timber offices, during the fiscal year.

Agency	Timber and Grazing								Forestry				Schools Lands					Revenue
	Bonus	Ground rent	Royalty on sales	Timber permits issued	Timber Seizures	Hay Permits	Grazing rentals	Sundries	Permit dues and rentals	Seizures	Grazing rentals	Hay permits	Timber permits issued	Seizures	Hay permits	Grazing Permits	Sundries	
																		$ cts.
Battleford				286	17	456	425	16	193	1	127	35	12	1	280	423	6	19,115 61
Calgary		44	37	136	14	217	578	11	272	2	237	13	4	1	322	1155	11	91,455 79
Dauphin				290	25	450	64		1110	52	147	264			250	72	2	18,551 02
Edmonton		44	49	1010	198	951	304	146	67	38	52	27	38	21	472	477	29	149,643 90
Grande Prairie	1			427	3	176	108	96							64			7,213 47
Kamloops	3	89	49	319	4	18	480	46	24		17	23						49,250 59
Lethbridge				11	12	45	946	5	451	15	294	2			37	433	7	41,802 17
Moose Jaw				3		525	1046	5	144	1	183	97			510	980	3	34,475 37
New Westminster	11	225	223	174	12			203										49,546 81
Peace River				447		292	162	1			1	7			86	51	1	10,219 27
Prince Albert	4	42	64	599	69	969	360	3	875	13	75	114	45	6	298	296	7	15,986 02
Revelstoke	2	97	23	95				36										22,048 85
Saskatoon				51	2	390	168	1	136	13	95	105	3		511	750	1	20,170 48
Swift Current				90	2	211	1436	6	315	10	436	11	1		152	714	5	46,328 41
Winnipeg		73	60	1095	80	721		60	206	8	194	137	83	16	662		1	100,489 29
Total	21	614	505	5033	438	5421	6077	637	3793	153	1846	833	186	47	3644	7849	74	876,297 04
Previous year	17	518	618	7088	323	8786	6385	1405	4723	123	1818	908	328	75	5257	5909	107	1,039,951 73

N.B.—Revenue exclusive of payments made direct to Department on account of respective Agencies.

STATEMENT B—Manufacture and Sale of Timber Products Cut by Holders of Timber Berths on Dominion Lands and School Lands under Yearly License and Permit during the fiscal year ended March 31, 1922

Agency	Lumber			Lath			Railway ties	Shingle bolts	Round timber	Saw Logs		
	Manufactured	Sold	On hand	Manufactured	Sold	On hand				Pieces cut	Manufactured	On hand
	Ft. B.M.	Ft. B.M.	Ft. B.M.					Cords				
Calgary	14,492,479	10,665,249	13,440,033	1,485,250	1,876,400	99,270	144,816		765,407	272,127	353,624	235,680
Edmonton	16,121,620	17,281,552	6,070,605	4,357,100	5,197,703	443,347	185,026		80,000	259,784	226,377	274,562
Kamloops	1,510,758	1,510,758					2,997	608	137,758	13,432	13,432	
New Westminster	77,009,320	77,009,320					43,794	26,733	47,140	112,762	112,762	
Prince Albert	52,770,670	65,022,771	21,470,697	15,032,817	17,216,767	2,691,950	33,696			706,018	791,490	514,180
Revelstoke	9,673,065	9,673,065						2,869	3,956	80,750	80,942	3,479
Winnipeg	16,649,586	19,136,070	7,005,594	4,387,738	5,931,438	134,400	1,990			121,206	311,074	260,154
Total	188,227,707	200,768,847	47,986,927	25,262,905	30,222,808	3,368,967	412,119	30,210	1,034,084	1,365,824	1,889,681	1,288,055
PERMIT BERTHS												
Calgary	1,464,890	1,431,628	949,416	16,640	25,813	12,946			2,846,891	16,646	25,813	12,946
Edmonton	13,397,220	11,016,003	6,592,620	307,950	282,950	25,000	159,356		276,499	273,043	241,870	150,479
Kamloops	7,003,443	7,003,443					42,616	100	21,231			
New Westminster	5,742,979	5,742,979					19,95	5,081	45,006			
Prince Albert	6,684,049	5,057,796	3,725,027				12,780		26,587	88,822	136,935	10,632
Revelstoke	773,490	773,490					10,278	870	1,791			
Winnipeg	6,906,327	4,655,179	4,307,786				47,170			134,910	141,017	92,038
Total	41,972,406	35,680,520	15,574,849	324,590	308,763	37,946	292,151	6,051	3,218,007	513,415	545,635	266,095
Grand total	230,199,913	236,249,367	63,561,774	25,587,495	30,531,571	3,406,893	704,270	36,261	4,252,089	1,879,239	2,435,316	1,554,150
Previous year	321,935,830	278,707,558	71,394,249	30,890,030	23,739,280	7,731,650	1,328,518	37,646	5,590,149	3,354,415	3,801,699	4,612,701

STATEMENT C—Timber material covered by Permits issued at the respective Agencies, principally to settlers during the fiscal year

Agency	Lumber and logs	Fence rails	Poles	Fence posts	Cord-wood	Rail-way ties	Poles, tele-graph and tele-phone	Round timber	Shingle bolts
	Ft. b.m.		No.		Cords	No.	No.	lin. ft.	Cords
Battleford.....	1,324,831	36,030	7,110	31,344	1,400				
Calgary.....	[illegible]	13,687	4,460	14,730	5,507	1,270	12,500	[illegible]	
Dauphin.....	3,117,456	4,060	5,470	47,140	[illegible]				..
Edmonton.....	[illegible]	49,337	[illegible]	[illegible]	[illegible]	[illegible]	1,070	[illegible]	
Grande Prairie.	[illegible]	[illegible]	91,998	[illegible]	[illegible]				
Kamloops.....	7,650,753	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		105
Lethbridge.....	[illegible]	[illegible]	670	39,591	[illegible]			599,718	. .
Moose Jaw.....	9,840	900	500	7,975	1,003				..
New West-minster..	[illegible]			3,000	748	19,951	45,006		4,895
Peace River....	2,760,298	441,149	85,538	[illegible]	5,703	7,100	[illegible]	[illegible]	.
Prince Albert...	15,029,461	292,048	26,757	271,732	36,278	[illegible]	[illegible]		
Revelstoke.	[illegible]			[illegible]	653	10,278	1,791		870
Saskatoon.....	[illegible]	100		11,285	1,113				
Swift Current...	52,130	7,680	1,405	23,110	2,739				.
Winnipeg.....	7,703,499	14,900	6,602	74,363	35,023	[illegible]	2,000	470	
Total.....	56,407,542	1,775,989	327,060	1,056,890	117,706	534,148	108,552	11,410,259	5,870
Previous year...	105,714,310	3,594,248	472,628	2,252,376	90,561	1,052,942	194,957	2,658,327	7,886

STATEMENT D—Number of Hay Permits issued at the respective Crown Timber offices and the amount of hay covered thereby for the fiscal year

Agency	Dominion Lands		School Lands		Forestry Lands		Revenue from Hay
	Permits issued	Hay	Permits issued	Hay	Permits issued	Hay	
	No.	Tons	No.	Tons	No.	Tons	$ cts.
Battleford.....	456	5,389	280	3,252	35	1,789	3,264 50
Calgary.....	217	3,636	322	6,128	13	302	2,873 36
Dauphin.....	450	5,593	250	4,360	264	4,450	3,909 48
Edmonton.....	951	7,472	472	3,982	27	825	4,282 30
Grande Prairie..	176	1,563	64	503			624 75
Kamloops.....	18	80			23	275	105 25
Lethbridge.....	45	386	37	313	2	15	151 40
Moose Jaw.....	525	7,491	510	6,849	97	3,166	4,215 40
New Westminster..							
Peace River.....	292	3,652	86	1,161	5	300	1,547 14
Prince Albert.....	969	8,451	298	2,692	114	3,000	3,728 71
Revelstoke.....							
Saskatoon.....	399	5,400	511	7,214	105	3,475	4,465 00
Swift Current.....	211	7,132	152	2,019	11	241	996 40
Winnipeg.....	721	7,258	662	7,634	137	2,703	5,089 62
Total.....	5,430	63,993	3,644	46,107	833	20,541	35,253 31
Previous Year.....	9,537	125,610	5,157	78,075	965	26,107	43,476 40

REPORT OF THE SUPERINTENDENT, ORDNANCE AND ADMIRALTY LANDS BRANCH, JOS. P. DUNNE

During the fiscal year there were no public sales of Ordnance lands held, but, with respect to lands previously sold or occupied under leases with the option of purchase, eighteen whole lots and six part lots, situated in the several localities hereunder mentioned, and in the accompanying statement lettered A, have been paid in full and letters patent issued.

Nepean—Nine lots forming part of a subdivision of a portion of township lots 39 and 40, 1st concession, Ottawa Front, now within the limits of the city of Ottawa, were sold at a valuation to the party in possession, in accordance with the provisions of the Ordnance and Admiralty Lands Act, the party in question having been in occupation of the land for many years, with the consent of the Crown.

Ottawa—Lots in this locality are occupied by tenants under terms and conditions embodied in the original leases granted by the Imperial authorities. One of such conditions being that the tenant may convert his leasehold into freehold at any time on payment in cash of the purchase price placed on the land. During the fiscal year eight whole lots and four part lots were redeemed and letters patent issued therefor.

Port Maitland.—One lot forming part of the reserve situated on the westerly side of the Grand river at this point and which has been occupied under lease with the option of purchase was redeemed in full and letters patent issued.

Sorel—Two small parcels of land, known as "Continuations", situated in the parish of St. Pierre de Sorel and which have been occupied for many years were sold to the party in possession and letters patent issued.

South Crosby—A small parcel of land, being a portion of lot 17, 8th Concession, in this township, forming part of the Canal reserve, and being no longer required for the purposes of the canal was transferred to this Department to be sold at a valuation to the party in possession, which was accordingly done and letters patent issued.

RAILWAY LANDS DIVISION

During the fiscal year, the activities of this division, in connection with the railway land subsidy work consisted chiefly in the auditing of the land accounts of the different railway companies which received a land subsidy from the Crown in the Prairie Provinces. Much correspondence passed between the railway officials and this branch in comparing and checking the result of this audit and adjustment.

Included in work relative to railway companies was a large volume of correspondence with the Grand Trunk Pacific Railway Company, the Edmonton, Dunvegan and British Columbia Railway Company and the Alberta and Great Waterways Railway Company in connection with the administration of the lands required for right of way purposes for these railways.

The following statement shows the acreage patented for railway subsidy and right of way purposes from this Branch during the fiscal year:—

Canadian Northern Railway Company	2,231.03 acres
Manitoba Southwestern Colonization Railway Company	209.63 "
Alberta and Great Waterways Railway Company	6.50 "
Edmonton, Dunvegan and British Columbia Railway Company	295.97 "
Total	2,743.13 acres

STATEMENT A—Number of lots and part lots sold or redeemed during the fiscal year

Locality	Number of lots sold or redeemed	Amount of consideration or purchase money	Amount received on account during fiscal year	Remarks
		$ cts.	$ cts.	
Nepean	9 lots	3,925 00	3,925 00	In full
Ottawa	pt. lot	95 00	95 00	In full
"	pt. lot	91 98	36 78	Balance of purchase money
"	pt. lot	100 00	100 00	In full
"	1 lot	400 00		Paid for previously 15–4–93
"	1 lot	370 33		"
"	1 lot	74 16		"
"	1 lot	83 33		"
"	1 lot	83 33		"
"	1 lot	83 33		"
"	1 lot	83 33		"
"	1 lot	400 00		"
"	pt. lot	100 00	100 00	In full
Port Maitland	1 lot	67 60	67 60	In full
Sorel	2 pt. lots	150 00	150 00	In full
South Crosby	pt. lot	133 32	133 32	In full
		6,240 71	4,607 70	

STATEMENT B—Localities where Ordnance Lands are situated on account of which monies have been received during the fiscal year

Locality	Amount
	$ cts.
Amherstburg	2 00
Anlac, N.B. (Westmorland Point)	64 00
Burlington Beach	60 00
Burritts Rapids	4 00
Carillon	0 40
Chaffey's Locks, Ont	133 32
Edmunston, N.B.	1 00
Elmsley	7 60
Fort Erie	2 00
Grand Falls, N.B	69 60
Grenville	2 00
Kingston	206 50
Montreal	100 00
Nepean	2 00
Niagara Falls	2 00
Old Sly's Rapids (Montague, Ont.)	4 00
Ottawa	6,186 13
Owen Sound	46 50
Port Maitland	99 18
Prescott	1 00
Quebec	830 00
Richelieu	150 00
Sarnia	200 00
Smiths Falls	50 50
Sorel, Que	4 00
St. Andrew's, N.B	1 00
Wolford	101 75
	8,330 48
Fees	116 00
Total	8,446 48

SESSIONAL PAPER No. 12

STATEMENT C--Receipts each month of the fiscal year; classified as fees, rents or interest equivalent to rent, and principal

Month	Fees	Rent or interest	Principal	Total
	$ cts.	$ cts.	$ cts.	$ cts.
1921				
April	20 00	134 50		154 50
May	6 00	712 59	4,040 00	4,758 59
June	8 00	185 60		193 60
July	10 00	364 10	95 00	469 10
August	3 00	54 47	36 78	94 25
September	13 00	956 89	250 00	1,219 89
October	39 00	31 18		70 18
November		248 00	100 00	348 00
December		8 40		8 40
1922				
January		100 00		100 00
February		470 90	40 00	510 90
March	17 00	268 75	233 32	519 07
	116 00	3,535 38	4,795 10	8,446 48

STATEMENT D—Amounts due and unpaid on account of purchase money and rent or interest for the fiscal year

Locality	Rent or interest	Principal	Total
	$ cts.	$ cts.	$ cts.
Beaver Harbour	2 12		2 12
Burlington Beach	470 00		470 00
Chambly	1 06		1 06
Dalhousie	30 36	23 00	53 36
Elmsley	5 96		5 96
Grenville	0 40		0 40
Grand Falls	219 96	238 17	458 13
Marlborough	21 35		21 35
Nepean	64 67		64 67
Niagara	312 65	507 00	819 65
Oromocto	1 74		1 74
Ottawa	2,290 37	4,963 00	7,253 37
Owen Sound	19 93		19 93
Oxford	2 94		2 94
Port Maitland	95 83	69 08	164 91
Presqu'isle	8 34		8 34
Quebec	2,093 75		2,093 75
South Crosby	4 42		4 42
Sorel	202 95		202 95
Tay	85 40		85 40
Wolford	145 30		145 30
	6,079 50	5,800 25	11,879 75

REPORT OF THE FINANCIAL CONTROLLER, P. MARCHAND

Statement of revenue collected from various sources during the fiscal year 1921-22

A	Dominion Lands, including Yukon	$2,918,529 59
B	School Lands	2,335,726 83
C	Ordnance Lands	8,446 48
D	Registration Fees, Yukon	524 64
E	Fines and Forfeitures	2,912 73
F	Casual Revenue	20,128 63
G	Seed Grain and Relief Repayments	372,350 89
H	Sales of Railway Lands, special account	8,800 00
		$5,667,419 79

A statement of revenue on account of Dominion Lands marked I shows the receipts classified under subheads.

Statement marked J shows a comparison between the revenue of the present fiscal year and that of the previous twelve months.

STATEMENT A—Dominion Lands Revenue for the fiscal year 1921-22

Agencies	Amount
	$ cts.
DOMINION LAND AGENCIES	
Battleford	32,773 53
Calgary	210,629 97
Dauphin	12,825 52
Edmonton	56,424 48
Grande Prairie	6,367 52
Kamloops	6,207 09
Lethbridge	42,564 17
Moose Jaw	152,128 90
New Westminster	2,243 63
Peace River	9,518 49
Prince Albert	19,435 42
Revelstoke	2,358 64
Saskatoon	80,460 11
Swift Cureent	238,182 14
Winnipeg	28,238 25
Miscellaneous	30,906 06
	911,265 92
CROWN TIMBER AGENCIES	
Battleford	11,869 19
Calgary	74,942 93
Calgary Irrigation Office	683 58
Dauphin	18,627 70
Edmonton	140,764 63
Grande Prairie	13,451 82
Kamloops	49,279 87
Lethbridge	42,082 23
Indian Head	2,007 65
Moose Jaw	17,978 23
New Westminster	153,000 41
Peace River	6,364 65
Prince Albert	115,319 72
Revelstoke	21,925 97
Saskatoon	7,315 47
Swift Current	41,101 14
Winnipeg	145,267 79
	$861,982 98

A—*Continued*—Dominion Lands Revenue for the fiscal year 1921-22

	Amount
Mining Agencies	$ cts.
Battleford	1,224 48
Calgary	239,021 81
Dauphin	12,896 43
Edmonton	215,004 92
Grande Prairie	30,164 77
[illegible]	743 55
Lethbridge	165,808 09
Moose Jaw	9,996 22
New Westminster	57,101 64
Peace River	61,429 56
The Pas	19,973 15
Prince Albert	8,962 80
Revelstoke	524 40
Saskatoon	1,085 68
Swift Current	6,640 83
Winnipeg	19,822 95
	851,971 18
Canadian National Parks	
Antelope Park	1,015 20
Buffalo Park	225 85
Elk Island Park	80 00
Fort Anne Park	45 00
Glacier Park	285 38
Ispsamx-Nora Reserve	215 00
Jasper Park	7,975 01
Kootenay Park	8 75
Moose Mountain Buffalo Reserve	452 60
Point Pelee Park	21 62
Rocky Mountains Park	59,208 63
Waterton Lakes Park	3,148 12
Yoho Park	1,544 12
Miscellaneous	79 00
	74,502 68
Yukon Territory	
Homestead fees	20 00
General sales of land	1,927 90
Rentals of land	5,229 47
Map sales, office and registration fees	30 00
Interim receipt account	61 60
Timber dues	9,991 79
Hay dues	22 40
Mining fees	46,147 75
Coal royalty and fees	235 31
Dredging leases	168 30
Export tax on gold	30,774 68
Free certificates for export of gold	4 50
Hydraulic leases	2,569 00
	97,182 10
Northwest Territories	
General sales of land	1,170 90
Patent fees	110 00
Registration fees	189 00
Suspense account	12 00
Liquor permit fees	194 00
Traders licenses	1,280 00
Trappers' licenses	1,599 00
Timber dues	2,370 68
Hay permits	36 75
Mining fees	1,399 00
Petroleum leases	113,443 00
Miscellaneous	20 40
	121,824 73
Total revenue	2,918,529 59
Less refunds	119,079 58
	2,799,450 01

STATEMENT B—Receipts on account of School Lands Revenue for the fiscal year 1921-22

Province	Gross Revenue	Refunds	Net Revenue
	$ cts.	$ cts.	$ cts.
Manitoba	213,214 41	9,418 90	203,795 51
Saskatchewan	1,511,292 73	35,993 18	1,475,299 55
Alberta	611,219 69	8,531 16	602,688 53
	2,335,726 83	53,943 24	2,281,783 59

STATEMENT C—Ordnance Lands Revenue for the fiscal year

Fiscal year	Gross Revenue	Refunds	Net Revenue
	$ cts.	$ cts.	$ cts.
1921–1922	8,446 48	8 58	8,437 90

STATEMENT D—Registration Fees in the Yukon Territory for the fiscal year

Fiscal Year	Gross Revenue	Land Assurance Fund	Net Revenue
	$ cts.	$ cts.	$ cts.
1921–1922	524 64	42 89	481 75

STATEMENT E—Fines and Forfeitures for the fiscal year

Fiscal Year	Northwest Territories	Northwest Game and Migratory Bird Act	Dominion Parks Regulations etc.	Gross Revenue	Refunds	Net Revenue
	$ cts.	$ cts	$ cts	$ cts	$ cts	$ cts.
1921–1922	222 00	641 90	2,048 83	2,912 73	744 00	2,168 73

STATEMENT F—Casual Revenue for the fiscal year

Fiscal Year	Particulars	Gross Revenue	Refunds	Net Revenue
		$ cts.	$ cts	$ cts.
1921–1922	Casual revenue, miscellaneous	20,128 63	8,779 03	11,349 60

STATEMENT G—Net Repayments of Seed Grain and Relief Mortgages for the fiscal year ended March 31, 1922

Year	Gross Collections	Refunds	Net Receipts
	$ cts.	$ cts.	$ cts.
1876	177 03		177 03
1886 7 8	832 48		832 48
1890	674 85		674 85
1894	1,492 34		1,492 34
1895	1,593 66	71 69	1,521 97
1896	841 79	9 36	832 43
1900	73 77	2 30	71 47
1901	283 17	2 12	281 05
1905	96 75		96 75
1908	3,677 12	43 35	3,633 77
1909	460 41	13 71	446 70
1911	2,466 87	6 74	2,440 13
1912	4,851 56	26 40	4,825 16
1913	1,182 14	4 14	1,178 00
1914	939 66	6 05	933 61
1915 S. G	175,527 65	6,009 02	169,518 63
1915 Relief	107,980 85	1,084 91	106,895 94
1917	2,652 70	101 07	2,551 63
1918	11,589 26	269 35	11,319 91
1919	26,196 81	418 59	25,778 22
1920 S.G	14,403 75	434 95	13,968 80
1920 Relief	11,128 34	3,252 86	7,875 48
1921 S. G	508 07	82 80	425 27
1921 Relief	237 00		237 00
Relief Advances prior to 1915	2,502 86	31 40	2,471 46
	372,350 89	11,870 81	360,480 08

STATEMENT II—Dominion Lands Revenue for the fiscal year ended March 31, 1922, credited to the special account of the following railway company

Railway Company	Date of Order in Council	Amount
Lake Manitoba Railway and Canal Co. Canadian Northern Railway System	December 5, 1908	$8,800 00

STATEMENT I—Gross Cash Receipts on account of Dominion Lands Revenue for the fiscal year ended March 31, 1922

Source of Revenue	Amount
	$ cts.
Homestead fees	73,540 00
Sale fees	170 00
Improvements	56,084 83
General sales of land	761,849 89
Timber dues	683,490 99
Rental from grazing lands	144,344 67
Export tax on gold, hay, coal, petroleum, etc.	1,071,395 56
Canadian National Parks	74,302 68
Map sales, rentals, office fees and miscellaneous	50,277 97
Liquor permits, traders' and trappers' licenses	3,073 00
	2,918,529 59

STATEMENT J—Gross Receipts (cash and scrip) on account of Dominion Lands Revenue for the fiscal year compared with the previous year

Particulars	1921-22	1920-21	Increase	Decrease	Net decrease
	$ cts.	$ cts.	$ cts	$ cts	$ cts.
Dominion Lands Agencies...	911,265 92	1,837,137 59		925,871 67	
Crown Timber Agencies.. .	[illegible]	696,025 30	165,957 68		
Mining Agencies.....	851,971 18	1,385,142 60		533,171 42	
Yukon Territory	97,182 10	90,920 91	6,261 1		
Canadian National Parks. .	74,302 68	76,850 09	.....	2,547 41	
Northwest Territories.....	121,824 73		121,824 73		
	2,918,529 59	4,086,076 49	294,043 60	1,461,590 50	1,167,546 90

PART II

CANADIAN NATIONAL PARKS

REPORT OF THE COMMISSIONER, J. B. HARKIN

The steady increase in travel to nearly all of the Canadian National parks has been the most gratifying feature of the past fiscal year (1921-22) and a matter for great satisfaction to all who are concerned with their administration. It indicates more clearly than words the great and increasing service these reservations are capable of rendering and, both from the economic and social aspect, justifies their creation, maintenance and development. A few years ago, Dr. T. G. Langstaff, the eminent alpinist, writing of the Canadian Rockies and the National parks in the "London Field," remarked that it seemed to him that Canadians scarcely realized the value of their unique possessions, and it must be admitted there appeared to be good grounds for his indictment. For many years the name of the Canadian Rockies was better known abroad than at home but there is now noticeable on the part of Canadians themselves a growing interest in the beauty of their own country and an appreciation of the rich possibilities for enjoyment and recreation offered by the National parks, and each year sees a steady gain in the number of Canadian visitors.

Owing to the high cost of railway travel this traffic has not yet reached the high water mark set in 1915, the year of the Panama-Pacific exposition, but it is noted with a great deal of satisfaction that people tend each year to remain an increasing length of time in the parks. While the total registrations are necessarily lower the use that is being made of the parks is a much better use and one that is more consistent with the ideals lying behind their creation. For while no one can travel through the Canadian Rockies or spend even a few hours among the wonders of the National parks without gaining a new conception of the greatness and beauty of Canada and of the possibilities of national life, still the mountains yield their real riches only to those who come and live among them, absorbing through days and weeks their strength and health and beautiful serenity. These are the things the parks were created to give and they cannot be gained by the visitor who rushes through them in a few hours either by railway train or motor car. The fact that so many Canadians are making the parks the objective for their entire holiday is, therefore, a matter for much satisfaction. The total travel to the parks during the past fiscal year is as follows:—

	1921-22
Banff National Park	71,540
Yoho National Park	3,000
Glacier National Park	3,223
Mount Revelstoke Park (estimated)	4,000
Jasper National Park (estimated)	7,000
Waterton Lakes National Park (estimated)	20,000
Buffalo National Park (estimated)	7,000
Elk Island National Park	5,443
Point Pelee National Park (estimated)	7,000
St. Lawrence Islands National Park (estimated)	30,000
Fort Anne National Park (estimated)	8,000
Total	166,206

THE YEAR'S TRAVEL ANALYZED

An analysis of the year's travel shows that 88,763 people went to the large parks along the main railway lines, of whom approximately 65,000 were from foreign countries. Estimated on the basis of expenditure used in this report in former years, namely, $300 for each foreign visitor, which is admitted to be a conservative figure, it means that the national parks are responsible for an indirect revenue of approximately $19,500,000.

The total appropriations for the National parks during the past year were $966,000. According to the last census the population of Canada numbers 8,775,853 so that the National parks last year cost the people of Canada about 12 cents per capita. As shown above however, they bring in an indirect revenue of $19,500,000, or a per capita return of approximately $2.22. That is indirect revenue. But it must be remembered that this $19,500,000 is divided among the people and increases their incomes to that extent. A good part of it is, therefore, taxable under the business and income tax so that a considerable percentage of it comes back again directly to the Dominion treasury by way of this tax. There are also other revenues from the parks, from the sale of timber and from various concessions and leases, which amounted last year to $72,000.

In addition there were approximately 27,000 foreign visitors to the smaller parks and while these, in some instances, as at Point Pelee park or the St. Lawrence Islands park, might represent an expenditure of only a few dollars, in the other cases and in the aggregate it would amount to a considerable sum. It must be remembered, too, that the parks performed a direct service, which cannot be calculated in dollars and cents, by serving as a means of recreation for nearly 75,000 Canadians.

A considerable part of the increase in Canadian travel must be credited to the increasing use of the automobile. An analysis of the registrations of cars at Banff shows that a very large percentage come from points on the prairies although there are cars from as far east as Winnipeg and from practically every section of the United States. The gratifying feature of this class of travel is that it also indicates that these great reservations are becoming each year more truly "people's parks". It means that they are no longer a luxury within reach only of the rich. Any one from Vancouver to Winnipeg who owns a car may now enjoy the delights and benefits of a holiday among the mountains at a slight expenditure of both time and money.

As was the case last year the greatest comparative gain has been in the smaller parks, Waterton Lakes park, which is becoming deservedly popular, again showing a very large increase. Elk Island park, which serves not only for a buffalo reserve but for a summer resort as well, also reports an increasing number of campers and at Point Pelee park in southern Ontario, although no registrations were kept, the superintendent reports that travel was the largest yet experienced.

A growing interest in the historic parks is also noticeable. Each year the honorary superintendent of Fort Anne park, Annapolis Royal, reports a steady gain. This year he estimates the number of visitors, not including people from the town itself, would total 8,000, the largest yet recorded in the history of the park.

The increasing number of demands for information of various kinds about the parks and requests for illustrated lectures on the part of schools, clubs, and other organizations, as well as for material for articles from newspapers and magazines evidences also a much livelier interest in the parks on the part of the general public and indicates the formation of a public sentiment out of which we may confidently expect to draw a large tourist travel in the future.

POSSIBILITIES OF TOURIST TRAVEL

For some years there has been pointed out in this report the tremendous undeveloped possibilities that lie within Canada's reach with respect to tourist travel. It

is increasingly apparent that the value of tourist traffic is now becoming widely recognized. The experience of those provinces which have undertaken special publicity campaigns and the prosperity that has followed the building of motor highways have convinced everyone that tourist travel pays, and that it can be developed like any other industry. Herbert Cuthbert, Secretary of the Pacific Northwest Tourist Association, at the Annual Conference of the organization in Tacoma in April, 1922, stated that five years ago tourist traffic into the Pacific Northwest was worth only $7,000,000. In 1921, as a result of organized publicity, it reached $40,000,000 and it was expected it would total $60,000,000 in 1922. An industry that can be developed from $7,000,000 to $60,000,000 in five years by an expenditure of a few hundred thousand dollars must be taken into consideration by every economist. The total dividends from the gold and silver mines of Ontario up to 1921, according to figures recently published in the daily press, have amounted approximately to only $115,000,000, or a little less than double what the Pacific Northwest States, including British Columbia, expect to receive this year.

From reports received from the different sections of Canada, and from railway, steamship, and motor travel figures, there is good reason to believe that a conservative estimate of the value of tourist traffic into Canada for the past year would total not less than $100,000,000. This means that it has already become one of our most important sources of wealth. As shown in previous reports when we bring money into the country by tourist travel it is just the same as if we exported goods to that amount and received money in return with this exception that we have sent nothing out of the country that leaves our capital stock diminished. Now compare the value of our four highest exports during the fiscal year 1921-22 with our export of scenery and they will be seen to rank as follows:—

Agricultural and vegetable products	$317,578,963
Wood and paper	179,925,887
Animal products	135,798,720
Foreign tourist travel	100,000,000
Iron and its products	27,312,272

That means that what we may call our export of scenery must already take fourth place in our foreign trade. It will be observed, too, that its total value amounted to only a little less than one-third of the value of our farm and garden products, while it is considerably more than half the value of our total forest products both raw and manufactured.

In the twelve months ending March 31, 1922, Canada's total exports amounted to only $740,240,680, as against $1,189,163,701 in 1921, and $1,239,492,098 in 1920. That is a decrease in foreign business of approximately $450,000,000 in one year. This is an enormous sum but it is less than the annual revenue of France from tourist travel in the years immediately preceding the war, and is approximately equal to the amount formerly spent by Americans in foreign travel each year. If under these circumstances we could attract to Canada a tourist traffic only four times what we are now receiving, it is clear that we should have achieved the same result so far as our national prosperity is concerned. And probably no one would deny that there is no part of Canada which is not capable of attracting four times as many tourists as it had last year. Organized publicity has brought about such results already in special districts. The growth of travel to the Pacific Coast States, as mentioned above, is now eight times what it was five years ago and similar results have been secured in California and other places that have turned their attention to an organized development of the industry. It is reported that at the present time from 30 to 40 per cent of all the gold in the world is stored in New York vaults. Part of surplus wealth of this kind can be drawn into circulation only through the purchase of luxuries. Now Canada manufactures few luxuries which she can export but she possesses other things that are equally valuable. Her scenery, her romance, her summer, and even her winter climate, her big game and wilderness areas can

all be made to serve as a magnet for foreign gold. It is impossible, too, to say to what limits an industry, that caters to a universally desired pleasure, may be developed. Twenty years ago the motor-car was practically unknown. To-day over ten billion dollars of private money is invested in cars in the United States alone and the annual upkeep must amount to hundreds of millions. The desire for travel is almost equally universal and in fact it is often one of the reasons behind the desire to own a car.

GROWTH OF MOTOR TRAVEL

The astonishing growth of motor travel into Canada has been one of the surprising features of the past year. According to figures collected by the Department of Customs the number of cars entering Canada during the calendar year has jumped from 93,300 in 1920 to 617,284 in 1921; of these 615,074 registered for less than one month, 2,211 for more than one month and less than six months. The entries by provinces were: Nova Scotia, 223; Prince Edward Island, 22; New Brunswick, 1,826; Quebec, 43,264; Ontario, 537,183; Manitoba, 8,020; Saskatchewan, 427; Alberta, 363; and British Columbia, 25,957. This shows that we have entered upon a new phase of the tourist industry. The wide distribution of profits from high prices during the war brought the automobile within reach of thousands of skilled workmen, farmers, and small tradesmen, and with it came the possibilities of travel. The thousand-mile journey has now become a commonplace. It is only necessary to build good roads, to provide adequate accommodation and to advertise the attractions of any district sufficiently and the travel will come.

There is one other consideration with respect to tourist travel that is not always recognized and that is its value as a forerunner of permanent settlement and financial investment. In an undeveloped country like Canada it is of inestimable advantage to have people from foreign countries touring through it and gaining an idea of its rich undeveloped possibilities, its great resources and its attractiveness as a place in which to live. Tourist travel, in fact, is one of the best immigration agencies, as it is also one of the best methods of attracting foreign capital, and a policy looking towards its development appears worthy of consideration along with policies of immigration or trade.

It is increasingly evident that other countries are coming to regard tourist travel seriously as an industry and are taking official steps to encourage it. Reference has been made before to the French Office of Touring and to the attitude of Italy in this regard. A pamphlet received from the Information Office for Tourists located at the Hague shows that action is also being taken by Holland. The bureau in question is supported by the Government and under its direct supervision. It plans tours throughout Holland, helps lovers of art to see the wonderful Dutch galleries, takes the artist to the picturesque villages near inland lakes, procures sailing vessels or motor boats for those who wish to undertake a yachting cruise, engages reservations in hotels and trains, and provides maps, charts, and guides, all absolutely free of cost. The traveller is thus relieved of all the petty worries of travel and knows in advance just how much his trip will cost. Service of this kind is of inestimable value to a tourist and it will probably not be many years until it will come to be adopted by all countries that are seeking to attract foreign travel.

BANFF-WINDERMERE ROAD

Construction operations on the Banff-Windermere highway were carried on throughout the year and the early completion of the road is now in sight. During the spring clearing was continued along the Kootenay and Vermilion divisions and grading was started in June. During the summer about 11 miles were graded from the north end, the road being completed to within a mile of Vermilion crossing.

From the south, grading was carried out from the end of the old British Columbia construction to Kootenay crossing, a distance of about 17 miles, so that during this season a total of about 28 miles of graded road was completed. The truss bridges at Vermilion crossing and Hawk creek, which had been partially completed the previous year, were finished. Clearing of the surveyed line was completed during the winter of 1921-22 and extra clearing of burnt-over timber carried out on the south end of the Kootenay division. On the Sinclair divisions portions of the road built by the Government of British Columbia through solid rock were widened. It is expected that this road will be ready for travel by June, 1923, or a year sooner than called for by the contract made with the British Columbia Government. The commissioner went over the road during the past summer by motor and horseback and was much impressed with the wonderful scenic attractions and the judgment shown in its location. The grandeur and beauty of this section of the Rockies can scarcely be surpassed, particularly as one approaches the beautiful Sinclair canyon where the road winds between towering walls of red rock. The area is rich in game of many kinds: sheep, goat, moose, elk, and bear are numerous and rapidly increasing. Indeed, the wild life along this road will undoubtedly prove one of its greatest attractions. To see these beautiful creatures moving fearlessly about, often feeding within camera shot of a motor car, is a unique and delightful experience.

As no hotel accommodation exists between Banff and Invermere, camp sites will be located at suitable points and equipped with stoves and other conveniences. The erection of specially designed warden's cabins, adapted also as shelter homes and social rooms will probably be considered later.

OTHER ENGINEERING AND CONSTRUCTION WORK

Rocky Mountains Park.—The most important work in the Rocky Mountains park was the completion of the new steel and concrete bridge over the Bow river at Banff. This is a very artistic structure that adds greatly to the appearance of the town and provides better facilities for the rapidly increasing motor traffic in the park. Several other bridges were constructed at different points, including a highway bridge over the Cascade river and trail bridges over the Spray river at two points.

Work was continued on the construction of the new 18-hole golf links at Banff and by the close of the year good progress had been made towards its completion. The new water-mains have been of great service in keeping the fairways in good condition.

Jasper Park.—A cement floor was laid on the new steel highway bridge over the Athabaska river, near Jasper, and the "fill" for the approaches to the bridge was completed. A new trail was constructed from Sunwapta to Southesk via Brazeau lake, work being carried out from each end towards the centre. At the end of the year only some eight miles remained unfinished. The old bridge over the Athabaska was dismantled. In addition maintenance work was carried out on the various park roads, trails, waterworks, and telephone lines.

Waterton Lakes Park.—Two timber bridges were constructed one over Cameron creek and one over Pass creek. Winter work was carried out on the Waterton-Akamina pass road, chiefly clearing and solid rock excavation. An ice-house with cold storage rooms was erected in the townsite. The construction of a new nine hole golf course was commenced and good progress made, so that the course will be in a playable condition during the summer of 1922.

Yoho Park.—The approaches to the new bridge over the Kicking Horse river at Field were completed and the bridge painted. As the old Canadian Pacific railway

grade in the vicinity of the Ottertail river had been abandoned as a highway, the old high trestle crossing the river was dismantled and the timber salvaged for use in construction purposes at various points in the park. Construction of a new bridge over the Kicking Horse river on the Leanchoil trail was also commenced before the end of the year.

Revelstoke Park.—The maintenance of the motor road up Mount Revelstoke involves each year considerable repair work owing to the damage done on the mountain side by melting snows. By keeping the ditches and culverts well open while the snow is melting it is found that washouts can be averted and as soon as spring opens these are at once cleared. It is hoped to complete construction work on the motor road to the summit during the coming summer. As soon as the west road from Revelstoke to Sicamous and Vernon is completed Revelstoke will have communication with the greater part of interior and southern British Columbia, which will result in very much increased motor traffic to this park.

The erection of a shelter house on the ski hill provided a much needed convenience. The ski tournament held at this park each year is among the most notable on the continent and attracts professionals and amateurs from all parts of America.

Kootenay Park.—Arrangements were made during the year for the topographical survey of the new Kootenay park. Much of this territory is virgin country and the geographical data in connection with it are very incomplete.

BUNGALOW CAMPS

The bungalow camp established last year at Wapta lake by the Canadian Pacific Railway Company proved very popular. It is becoming increasingly evident that this class of accommodation meets the requirements of a large part of the travelling public, providing as it does plain but comfortable sleeping quarters and an excellent table. This simple accommodation, in touch as it is with the actual out of doors, is preferred by many genuine nature lovers and people of refinement. It is expected in the near future similar accommodation will be provided in Jasper and Waterton Lakes parks.

MOSQUITO CONTROL AT BANFF

The interesting work, which was begun last year, looking towards the extermination of mosquitoes in the vicinity of Banff, was continued during the summer. In view of the extraordinary differences in the breeding habits of these insects it was seen that in making any attempt at competent control it was necessary to have an expert and intimate knowledge of the species concerned and of the local conditions. The services of three young entomologists, university students, were secured, and they began work on May 15 under the direction of Mr. N. B. Sanson, curator of the Banff museum. From that date to the end of June they kept watch on the breeding areas, spraying with oil wherever larvæ were found and collecting specimens for identification. It was found that the most important species to combat in the neighbourhood of Banff is the *aedes*, members of which breed in flooded areas and when hatched out into adults may travel as far as four or five miles. The eggs are laid in the water and when the latter evaporates or drains off they are left on the sod. Before hatching they have to become dry and then, on the land being reflooded, will hatch out. Experiments show that eggs will remain fertile for as long as six years. During the larva and pupa stages the insects must breathe through the surface of the water and a thin film of oil spread upon the surface will cause suffocation inside of a maximum time of four hours. The areas flooded by the Bow and Echo rivers and Vermilion lakes were given attention during the first week following

the rise of water, and systematic oiling operations carried out. Later a foreman and three men were set to work clearing out the heavy willow growth to make trails to and around the sloughs, and some filling in and draining, as well as dyking on a small scale, were undertaken.

In June Mr. Arthur Gibson, Dominion Entomologist, and Mr. Eric Hearle, who is in charge of the mosquito laboratory in the Fraser River valley and one of the foremost mosquito experts on the continent, visited the park, inspected conditions both at Banff and Lake Louise, and made a number of valuable recommendations. The marked decrease in the number of mosquitoes during the tourist season brought very favourable comments from visitors and it is the intention to carry on the work more extensively next season.

FISHING

Thanks to the excellent work being done by the Department of Marine and Fisheries in the maintenance of hatcheries, the fishing in park lakes and streams continues good, and, particularly in the parks on the east slope of the Rockies, forms one of our most important tourist attractions. Waterton Lakes park probably ranks first as a fishing resort, the lake itself and practically all its tributary streams abounding in trout of a good size and quality. Lake trout, too, the largest game fish found in the parks, specimens of which are sometimes taken weighing as much as 50 pounds, are found in Waterton Lakes park. As is well known, the lower Waterton lake extends across the boundary into the United States Glacier National park, so that it becomes an international fishing water. Last year fry were again received from the United States park and deposited in the upper waters of the lake, thus benefiting the fishing in both parks.

About half a million fry were liberated in the waters of Rocky Mountains park from the Banff hatcheries during the season: 300,000 rainbow and cutthroat trout in July and 200,000 of the same varieties in August. The Spray Lake hatchery had one of the best seasons in its history, the return of spawning cutthroat being greater than ever before.

RECREATIONAL AREAS

An interesting phase of recent development is the creation of so called "recreational areas." These are reservations of Crown lands which are adapted for public use and enjoyment for summer resort and recreational purposes but which do not possess scenery of sufficient importance to justify their creation as national parks. They are usually lands about a lake, which are unfit for agriculture and so have remained unpatented, but which are adapted for summer cottage sites and recreational purposes. In response to strong local demands investigations have been made of several such lakes in the Prairie Provinces and their reservation is now under consideration.

REVENUE

The total revenue for 1921-22 was $78,907.21. While this was $2,214.89 less than the previous year, the apparent decrease is accounted for by the fact that the revenue for 1920-21 contained two unusual items: the $1,341.15 which resulted from the sale of muskrat skins at Point Pelee park and $3,975.70 derived from the sale of buffalo heads and robes at the Montreal fur sales. If these two items were omitted from the previous year's returns the past year would show a gain of $3,100.96.

TIMBER PROTECTION

The betterment of the patrol system, increased telephonic communication, improvement of the mechanical fire-fighting apparatus, and the detailed instructions given the warden service in the use of the portable fire-engines developed by this branch, had a good deal to do with the lower acreage of timber destroyed by the season's fires. A comparative statement of the season of 1921 with that of 1920 shows:—

	1920	1921
Number of fires..	94	70
Acres damaged..	6,003 acres	2,614 acres
Cost of extinguishing..	$7,585.93	$8,296.26

The average number of wardens for the year was 52, compared with 48 in 1920, and their patrol covered 194,854 miles compared with approximately 141,700 miles in 1920.

A new and improved model of the small portable gasolene fire-pump, designed by the Canadian National Parks Branch for fighting forest fires in the parks, has recently been developed. These units, which were introduced a few years ago, have proved themselves so successful that they have been adopted by practically all organizations engaged in forest protection work in Canada and by many in the United States as well. Seven of these units were recently used in one of the parks in relays pumping through one to the other from a mountain stream situated a mile and a quarter from the scene of the fire and excellent results were secured.

The forests of the National parks are now protected by thirty of these engines, which are modelled along the lines of the gasolene marine motor but so reduced in bulk and weight as to be readily portable on pony back over the mountain trails, by gasolene speeders along the railways or over the 400 miles of motor highways in the parks by automobiles.

Construction work during the year included 208 miles of trails, 109 miles of telephone lines, and 8 cabins. The telephone line from the city of Revelstoke to the cabin at the top of the mountain was completed. An important inauguration also was the construction of the telephone line running from the Red Deer cabin No. 18 in District 10, Rocky Mountains park, to the Forestry cabin on Red Deer river.

No direct aeroplane patrol work has been carried out in the Canadian national parks except in Waterton Lakes park, but during the season of 1921 a number of fine oblique photographs were taken of the different main valleys to show the water and timber areas in Jasper park.

Twelve sets of artillery field telephones, useful as temporary fire lines or on construction work, were distributed among the parks.

The fire protection work included the ploughing of 139 miles of fireguard at Buffalo park and 19 miles at Elk Island park. A volunteer fire brigade was organized in Field, making the third of such bodies now in the parks, brigades at Jasper and Banff having already been established. Thirty camp stoves of cast iron and concrete body were distributed among Banff, Jasper, Waterton Lakes and Yoho parks to meet the outdoor cooking requirements of tourists and campers.

SESSIONAL PAPER No. 12

STATEMENT OF FIRES IN CANADIAN NATIONAL PARKS, SEASONS, 1920, 1921

Date	Name of Park	Unknown	Campers	Railway	Lightning	Other Causes	Total	Cost of Extinguishing
1920	Rocky Mountains.	2	21	8	2	1	34	$ 4,425 46
	Jasper		8	39			47	840 22
	Waterton		1				1	50 70
	Glacier			1	5		6	1,648 50
	Yoho		1	1	3		5	620 00
	Kootenay		1					
		2	32	49	10	1	94	$ 7,585 93
1921	Rocky Mountains.	3	15	7			25	$ 1,528 12
	Jasper	1	5	27			33	1,333 59
	Waterton	1	1			1	3	4,782 72
	Yoho				1		1	70 90
	Glacier				1		1	43 75
	Kootenay		1		1		2	336 10
	Buffalo		2				2	195 03
	Elk Island and Point Pelee					3	3	3 05
		5	24	34	3	4	70	$ 8,296 26

TOWN PLANNING

In 1921 the town planning office previously a part of the Commission of Conservation was transferred to the Canadian National Parks Branch. By this transfer the services of the town planning division were more intimately available for the planning of community life within the limits of the national parks and for the better provision for the needs of tourists, while at the same time the educational work of the division could proceed as in the past.

The educational work of the branch which has been carried on in Canada during the past seven years with such good results was also continued. Lectures were given by members of the staff at the universities of Montreal and Toronto and at various places where civic authorities are contemplating town planning improvement. Exhibits of town planning material were provided for various conferences and public meetings and lantern slides and lectures sent to distant parts of the Dominion from coast to coast. Where there is no provincial town planning executive or no provincial town planning act, private citizens who are desirous of improving the methods of town development usually write to Ottawa, and advice and literature are sent to them. Much assistance has been given to the Journal of the Town Planning Institute of Canada, both in preparation of literary material and in the provision of plans illustrating the movement and advantages of town planning methods.

Projects

Among other projects are the following:—

Rocky Mountains Park.—Plans for the improvement of the general layout, street system, and buildings; designs for the grounds of the various public buildings and general planning at Canmore; plans for the general improvement of Banff and detailed studies for the improvement of Banff avenue, layout of an automobile camp on a fairly large scale for Banff, with the buildings that will be required, lighting, water, and drainage systems; layout of automobile camps at lake Louise and on the road from lake Louise to Banff.

Kootenay Park.—Layout of automobile camps on the Banff-Windermere road; layout of townsite at Radium Hot Springs together with plans of buildings that may be required there, *e.g.* swimming pool, etc.

Jasper Park.—Layout of townsite at lac Beauvert together with designs for buildings required golf club house, bath house, etc.; plans of a layout scheme for the various government buildings at Jasper, some of which are already erected, *e.g.* garage, stores, stables, etc., layout of a townsite in connection with Miette Hot Springs.

Waterton Lakes Park.—Revised layout for business section, new residential areas, auto camp, plans for community building, etc.

Elk Island Park.—Layout of lots for summer cottages with plans for buildings that may be required.

Brereton and Norah Lakes.—Layout of lots for summer cottages.

Historic Sites.—Plans for the improvement of the various historic sites.

PROTECTION OF ANIMAL LIFE IN THE PARKS

There is perhaps nothing in connection with the work of National parks that is a cause for more satisfaction than the steadily increasing abundance of practically every form of wild life. It offers a demonstration of the value of sanctuaries more impressive than any arguments, and shows how quickly a species will re-establish itself under adequate protection as well as how readily wild animals will accustom themselves to the presence of man, once they are convinced there is nothing to be feared. The decrease of larger game mammals throughout much of the continent makes the abundance and fearlessness of the larger mammals in the National parks an increasing attraction to tourists and this attraction is bound to increase as the game in unprotected portions of the country diminishes or is driven off to more remote sections. Indeed the time may not be very far distant when it will be only in such protected reserves that some of our larger mammals will be known to future generations. In this connection it is interesting to note the observations of Dr. Henry Fairfield Osborn, President of the American Museum of Natural History, at a meeting of the American Society of Mammalogists in New York City in May last. Mr. Osborn is reported as saying that we are now witnessing the close of the age of mammals, an elimination which was begun by man about 400,000 years ago but which has become acute in recent years. "Nothing in the history of creation", said Dr. Osborn, "has paralleled the ravages of the fur and hide trade which now, with the bone fertilizer trade, threatens the entire vertebrate kingdom." Other distinguished mammalogists present predicted that it will be only a matter of years when wild game will be seen only in museums and picture books. In view of these gloomy predictions it is doubly gratifying to witness the steady increase of wild life in the parks and to note that the natural overflow is gradually re-stocking the adjacent districts. These areas seem likely to be in the future the most important museums and schools of natural history, and it is a matter for satisfaction to realize that they must become as time goes on increasing sources of delight and interest to the student or lover of wild life.

The increase in bighorn sheep and Rocky Mountain goat in all of the mountain parks is everywhere apparent. While it is obviously impossible to form an accurate estimate of their numbers without a careful survey, it is interesting to note that the superintendent of Jasper park estimates that there are now 10,000 bighorn and 5,000 goat in that park where ten years ago these animals had been almost exterminated. The numbers in Banff park must also reach a large figure. The elk herd procured from Yellowstone park in 1920 has done splendidly and practically doubled in numbers. Deer are found everywhere in abundance and moose are steadily increasing.

Buffalo.—At the close of the fiscal year the total number of buffalo in the parks was 6,539; of these 6,146 are in Buffalo park, 280 in Elk Island and 13 in the small exhibition herd at Banff. The increase for the year was 1,102. The proposed slaughter of surplus males has not yet been undertaken but it has become imperative that action should be taken in this connection in the immediate future as the present range is overstocked.

The addition of 19 square miles to Elk Island park brings the present area of this fenced animal reservation up to 35 square miles. The extension takes in all that portion of the Cooking Lake forest reserve lying north of the Edmonton-Tofield highway. The new area will not only provide additional grazing grounds for the buffalo, elk, deer, and moose in the park but will supply further opportunities for recreation. Its proximity to the motor highway, too, will make it much more accessible to the general public and a large increase of visitors is expected as a result.

The abundance and fearlessness of many forms of wild life in this park are a constant source of pleasure to tourists. Fine big mallards will sit on a lake only 20 feet away from a humming motor and the sight of bands of elk moving freely through the open woodlands never fails to give delight.

Antelope.—The antelope herd at Nemiskam continues to thrive and, according to reports received from the caretaker, although no actual count has been made, is believed to number considerably over 100. The success of this experiment has led to a determination to establish other reserves of a similar nature, and two additional areas, one in southern Alberta, the other in the Medicine Hat region, will shortly be set aside and proclaimed national parks for the preservation of this species. There is no doubt that these sanctuaries are urgently needed if the antelope is to be preserved from extinction. The chief game guardian of Saskatchewan estimates that there are now only about 250 wild antelope left in the whole of that province. The number in Alberta, in the opinion of the provincial chief game guardian, is not more than 1,000. As is well known antelope disappeared several years ago from Manitoba. It is therefore evident that the species is now on the verge of extinction and unless immediate steps are taken must inevitably disappear. The efforts being made for their preservation in the Dominion sanctuaries are therefore of great interest and importance. It is perhaps too soon to say yet that the antelope can be saved but it is certainly encouraging to note the good results so far obtained in the Nemiskam reserve, which appear to indicate that they can be successfully bred in captivity.

Predatory Animals and Birds.—Coyotes are troublesome and it is necessary to keep up a continual war on these pests. The caretaker also reports that there is a species of eagle which he finds is nearly as great an enemy to the young antelope as the coyote. Two young antelope were caught and killed this spring in the reserve, both by eagles. Efforts to protect the herd from these birds will therefore be made.

Donations to Other Parks.—A number of donations of wild animal specimens from the parks was made including 6 Rocky Mountain sheep to the Zoological Society of New York and 12 Rocky Mountain sheep to the Bison range, Montana. Eight sheep will also be shipped to the State Game farm in South Dakota when weather conditions permit.

Farming.—The farms maintained within the parks for the production of feed for the animals continue to give good returns and are resulting in a substantial saving to the department. Farming operations are now carried on at Waterton Lakes park, Elk Island park, Rocky Mountains park and Buffalo park. At Rocky Mountains and Elk Island only haying operations are carried on, 56 tons having been put up in the former and about 350 in the latter. At Waterton Lakes park there were grown 967 bushels of oats and 74 tons of hay. The crop at Buffalo park was not

quite so large as the previous year when the yield was exceptionally heavy, but it amounted to 9,200 bushels of oats, 180 tons of straw, 850 tons of hay and 35 acres of green fodder, which were estimated at a total value of $22,712.

PROTECTION OF MIGRATORY BIRDS

The enforcement of the Migratory Birds Convention Act has been continued throughout the year and the great value of the new regulations in protecting the birds of the continent, which pass through Canada and the United States in course of migration, has been evinced by reports received from practically all sections of the country. While there are a few localities in which increases in migratory bird life have not been apparent, these it may be assumed have suffered because of some unfavourable local condition. Taking the country as a whole the reports show a marked increase in bird life of many kinds. In some localities, it is true, misapprehension concerning the fundamental principle underlying the treaty still exists. It has been said that it favours the United States shooter, a belief which can arise only from an erroneous conception of the Act. In some cases it has been necessary to point out that no seasons for migratory waterfowl in the United States extend beyond January 31 in any year which means that the treaty has effectually stopped the destructive practice of spring shooting. To the stoppage of this practice and to the fact that the sale of migratory game birds is forbidden throughout most of the continent, the general increase in migratory waterfowl is undoubtedly due.

In the summer of 1921 an amendment was made to the regulations under the Migratory Birds Convention Act which brought into effect certain minor changes in open seasons, added some provinces to those in which the sale of migratory game birds was forbidden, and altered slightly the restrictions placed upon certain methods for capturing these birds.

The permanent organization for the enforcement of the Act throughout Canada has been kept at approximately the same strength and, in addition to the enforcement of the Act, the staff has engaged in continuous efforts through lectures, publicity, and in other ways to extend information concerning the value of birds and the need for their protection. In carrying on this work throughout Canada the staff has enjoyed the fullest co-operation with the provincial game departments and, except in provinces where the provincial law does not conform to the treaty, the actual enforcement of bird protection measures has been left largely in the hands of the provincial authorities.

One hundred and thirteen honorary game officers were appointed during the year, bringing the number of our honorary staff up to 1,722. Through the co-operation of the Forestry Branch of the Department of the Interior all forestry officers throughout the Dominion were also appointed honorary game officers and they are furnishing this office with important information concerning the value of the various forest reserves as breeding grounds for migratory waterfowl. The officers of the Marine and Fisheries Department stationed along the Atlantic coast and the officers of the Royal Canadian Mounted Police throughout Canada have also co-operated in bird protection work. As a result, too, of negotiations with the province of Alberta, the provincial authorities agreed to have their provincial officers act as honorary game officers under the Migratory Birds Convention Act.

Educational

Educational work with regard to the meaning and value of the treaty was again carried on. Further editions of previous pamphlets on bird protection were published during the year, the total distribution of pamphlets of all kinds amounting to 125,813. Publicity concerning the shooting seasons and other bird protection matters was

obtained through the distribution of 34,661 posters. The Post Office Department co-operated with the branch by having one of the posters regarding open seasons under the Migratory Birds Convention Act placed in each post office in Canada.

The most important bird publication of the year was a pamphlet entitled "Lessons in Bird Protection". Eighty thousand copies of this pamphlet, sufficient to supply each school teacher in Canada with one copy, were published and distributed. This publication has now been authorized for use in every school in Canada.

Eighty-five lectures on bird protection were given by members of the permanent staff during the year and lantern slides and other material were furnished to honorary officers and others so that they might deliver lectures on this subject. Moving picture films of bird life were also distributed and proved an excellent publicity medium.

Short articles in connection with the work were also written by many of the game officers of the branch as well as by the honorary game officers. Mr. A. G. Lawrence, one of the western honorary officers, began the publication in a Manitoba paper of a weekly column on birds. The preparation of material for a weekly column of bird news involves a great deal of labour on the part of Mr. Lawrence, but its educational influence is undoubtedly far-reaching and beneficial.

Copies of the late Dr. Hewitt's book "The Conservation of Wild Life in Canada," were sent to all honorary game officers.

Two exhibits of protected birds were prepared for display during the winter carnival at Ottawa in January last. One of these, through the courtesy of the Canadian National Railways, was displayed in the window of their main offices on Sparks street. It consisted of about 20 specimens of mounted birds, named in English and French, as well as a large seizure of gull plumage. A poster explained that all these had been seized for illegal possession and as the display attracted a great deal of attention it is believed that it served to educate a great many people as to some of the birds which the general public does not yet appear to realize are protected under the Migratory Birds Convention Act. This exhibit was later taken to Montreal and shown in the window of the Canadian Pacific Railway Telegraph office there.

Following the decision of the Department of Justice that Indians in Canada are amenable to the provisions of the Migratory Birds Convention Act, a special poster has been prepared to acquaint Indians in the different parts of Canada with the provisions of this Act.

The National Association of Audubon Societies has agreed to the extension of its Junior Bird Club organization to Canada. This involves a very considerable expense to the association, and the branch was much gratified to learn of the successful termination of negotiations which had been instituted to bring about this desirable end. The formation of bird clubs in the schools and the valuable publications, including "Bird-Lore," distributed by the association, form one of the best methods of educating children with respect to the importance of bird protection, and the extension of the work to Canada is bound to result beneficially. The various provinces have been acquainted with the result of negotiations for the establishment of these bird clubs in Canada and, with few exceptions, the departments of education have approved of the plan.

As part of its work for the preservation and protection of valuable bird life the branch has been encouraging the building of bird-houses and early in the present year honorary game officers were written to and asked to organize bird-house competitions among the children of their neighbourhood. In Ottawa and some of the larger cities the manual training teachers have directed the boys in the building and designing of bird homes and more than 2,000 bird dwellings have been built this spring in the city of Ottawa alone. A number of bird-houses were also made and erected in some of the national parks.

One of the most important aids to the study of bird life lies in the work of bird banding which is now being officially directed from the Biological Survey at Washington, D.C. A considerable number of people in Canada were already carrying on this work but the desirability of having workers in every part of the country suggested that the undertaking should be extended if possible. A circular was accordingly drafted and sent to all honorary game wardens and other persons interested in bird protection explaining the work and suggesting co-operation.

Bird Sanctuaries

The creation of bird sanctuaries, which is an indispensable part of the work of bird protection in Canada, is going steadily forward.

Following investigations by the chief federal migratory bird officer for Ontario and Quebec, who studied conditions on the north shore of the gulf of St. Lawrence during the summer of 1921, a recommendation has been made that ten bird sanctuaries be established on this coast. These have been selected with great care and should serve as valuable refuges for the important bird life of this region. This matter is still under advisement but it is hoped that early action will be taken.

The bird sanctuary at Last Mountain lake, Saskatchewan, which has been under preservation since 1887, was brought under the Migratory Birds Convention Act by an Order in Council during the summer of 1921.

A preliminary survey of provincial game reserves in the province of Manitoba was also made, and the report on the matter is at present before the department.

It is interesting to note that the existence of the bird sanctuary on Bonaventure island near Percé, Gaspé county, Quebec, is proving a noticeable attraction to tourists. During the summer of 1921 numbers of prospective guests had to be turned away because of lack of accommodation, although the principal hotel in Percé was considerably enlarged last spring. The residents regard the sanctuary as very desirable and it is the source of a considerable income to those living in the vicinity, because of the money spent there each summer by visitors attracted by the bird colonies.

As the public learn the necessity for the creation of bird sanctuaries various objections to them became less frequent. The sportsmen are already fairly well acquainted with the necessity and desirability of setting aside breeding grounds for game birds, but this necessity is not so generally understood by the farming communities. With a view to acquainting persons in Western Canada, who may apply for permission to use sanctuary lands for various purposes, with the need for bird sanctuaries, a circular was drafted and a copy sent to all such applicants, making it clear that without these sanctuaries the supply of migratory water-fowl in the future would be seriously reduced. The continued reduction of the marsh and lake areas in the western provinces of Canada, because of the extension of agriculture and drainage operations, cannot but have a serious effect upon the supply of water-fowl in the future.

Arrangements have been completed with the Natural Resources Department of the Canadian Pacific Railway for the creation of a bird sanctuary on the property of the railway at lake Newell, Alberta.

Public Shooting Grounds

While the policy of the branch is to use every effort to secure the protection of migratory wild-fowl and to set aside for this purpose available sanctuaries for breeding grounds, it is also of the opinion the public should have access to a fair and reasonable share of the game. It is, therefore, recommending the creation of public shooting grounds where any citizen of Canada may have the right to hunt.

Several of the provincial governments have made recommendations concerning areas which they consider should be set aside as shooting grounds of this kind, and already certain of these areas have been inspected by officers of the branch. In this connection the province of Alberta recommended the setting aside of 57 lakes, while the province of Saskatchewan recommended the setting aside of 15 lakes. The movement is one that has received the almost unanimous support of sportsmen, who recognize that if the two policies are carried out—(1) adequate protection by sanctuaries, and (2) public shooting grounds where hunting is permitted under whatever restrictions the game supply warrants—there will be permanent shooting for every one.

Prosecutions

During the year the branch took court action in 86 cases for violation of the Migratory Birds Convention Act. Convictions were registered in 79 cases, in 6 of which the sentence was suspended; 4 cases were dismissed, 3 were withdrawn. The total fines imposed amounted to $865, while 6 guns, 1 boat, 54 bird specimens and 7 pieces of miscellaneous equipment were confiscated.

At the request of the Association for the Protection of Fish and Game in the province of Quebec the supervisor of wild life protection spent two days in Montreal attending court and giving expert evidence as to the identification of some thirty shore birds that had been seized by the officers of the association in carrying out the provisions of the provincial game laws.

Permits and Licenses

One hundred and sixty-three permits were issued allowing the holders to take birds for scientific purposes and 21 permits allowing the capture of protected birds for banding purposes. The following numbers of permits allowing the capture and possession of migratory birds for propagating purposes were issued during the year: 7 allowing the possession of migratory birds in British Columbia, 23 allowing the possession of migratory birds in Ontario, and 33 allowing the capture and 175 allowing the possession of migratory birds in the other provinces of Canada. Four permits allowing the killing of migratory birds found injurious to fishing interests and 4 allowing the killing of migratory birds found injurious to agricultural interests were issued from this office during the year. In addition, 68 taxidermists' licenses were issued.

Copies of the permit principles which form part of each of the scientific permits issued by this branch are being distributed as a circular with each scientific permit issued by the state of California, due credit being given to the Department of the Interior, Canada.

Advisory Board on Wild Life Protection

During the year this board held five meetings. It now includes representatives from seven departments, the membership having been increased during the year by the addition of the following persons: Mr. Arthur Gibson, Dominion Entomologist, Department of Agriculture; Colonel A. B. Perry, C.M.G., Commissioner of the Royal Canadian Mounted Police; Dr. E. E. Prince, Dominion Commissioner of Fisheries, Department of Marine and Fisheries; and Mr. O. S. Finnie, B.Sc., D.L.S., Director of the Northwest Territories Branch, Department of the Interior. The Supervisor of Wild Life Protection, who had been acting secretary of the board, was appointed secretary.

Importation of Foreign Species

At the instance of the branch the Customs Tariff respecting the importation of birds and mammals was revised by the addition of the following to the prohibited list:—

(1) Aigrettes, egret plumes, or so called osprey plumes, and the feathers, quills, heads, wings, tails, skins or parts of skins of wild birds either raw or manufactured. This provision does not apply to:—

(*a*) the feathers or plumes of ostriches;
(*b*) the plumage of the English pheasant and the Indian peacock;
(*c*) the plumage of wild birds ordinarily used as articles of diet;
(*d*) the plumage of birds imported alive, nor to
(*e*) specimens imported under regulations of the Minister of Customs for any natural history or other museum or for educational purposes.

(2) Common mongoose or mongoose of any kind; common mynah, Chinese mynah, crested mynah, or any other species of the starling family; Java sparrow, rice bird, nutmeg finch or other species of the weaver bird family; European chaffinch; and great titmouse.

General

A number of petitions were received from different parts of Canada including Alberta, Saskatchewan, Quebec, and Nova Scotia, asking for the suspension or modification of regulations under different Acts, federal or provincial, respecting bird sanctuaries, protected birds, open seasons, or the whole or partial opening or closing of certain areas to hunting and fishing. In every case the petition was given the most careful consideration and the reasons for the decision arrived at explained to the petitioners. Some matters were still under advisement at the end of the year.

NORTHWEST GAME ACT

On 1st January, 1922, the administration of the Northwest Game Act passed from the National Parks Branch to the newly created Northwest Territories Branch. The transfer included the administration of the Wood Buffalo herd near Fort Smith, Northwest Territories, and the reindeer herd at Lobster Bay, Quebec, a herd which is to be used for developing the Northwest Territories. Assistance was given the new staff in handling the work and acquainting them with procedure.

Licenses and Permits.—Licenses under the Northwest Game Act have been issued during the year as follows:—

Hunting and Trapping: Residents, 113; non-residents, British, 17; non-residents, non-British, 10.

Trading and Trafficking: Residents, 160; non-resident, British, 2; non-resident, non-British, 1. The revenue received from these licenses amounted to $2,151.

The following is a statement of the game taken in the Northwest Territories under the Northwest Game Act licenses as shown by returns received during the fiscal year 1921-22, with the average value and approximate total value of the furs secured:

Animal	Hunting and Trapping	Trading and Trafficking	Totals	Approximate value of pelts	
				Average	Total
	No.	No.	No.	$ c.	$ c.
Moose	34	22	56		
Caribou	371	431	802		
Deer	40	30	70		
Mountain sheep	6	5	11		
Mountain goat	4		4		
Otter	9	54	63	24 25	1,527 75
Beaver	126	1,908	2,034	15 00	30,510 00
Marten	847	4,344	5,191	37 50	194,662 50
Fisher	6	12	18	48 75	877 50
Mink	647	4,012	4,659	12 00	55,908 00
Muskrat	7,970	79,941	87,911	1 60	140,657 60
White fox	3,001	12,684	15,685	37 50	588,187 50
Wolves	188	149	337	7 50	2,527 50
Wolverines	77	114	191	6 00	1,146 00
Lynx	23	94	117	18 00	2,106 00
Ermine	1,339	6,181	7,520	85	6,392 00
Bears	44	702	746	12 00	8,952 00
Skunks	17	32	49	3 60	176 40
Foxes	229	1,036	1,265	15 50	19,607 50
Blue fox	1	8	9	90 00	810 00
Red fox	2	5	7	15 50	108 50
Cross fox		5	5	35 75	178 75
					1,054,335 50

The wolf bounty paid during the year amounted to $3,320, covering payments of $20 each for 166 wolves.

There have been two convictions for violation of the Northwest Game Act during the year. Fines amounting to $150 were imposed and 5 white fox skins seized.

Reindeer Herd.—The reindeer herd at Old Fort, in the province of Quebec, has been cared for as usual by a staff consisting of a supervisor and three men. The herd according to the latest returns consists of about 167 animals all of which, the supervisor reports, are in good condition.

PROPOSED EASTERN PARKS

The great benefits accruing from the National parks make it seem more and more desirable that these should be established more generally throughout Canada. As has been pointed out in previous reports it is especially important that reservations for public enjoyment should be made within reach of our large centres of population. These would be undoubtedly of great benefit now but they are bound to be of immensely greater value as our population increases and the great hinterland of Canada disappears. Throughout Ontario and the eastern provinces there are still wilderness areas that are specially adapted for recreational purposes and that could be acquired now and set aside at slight expense. If considered only as an attraction to foreign tourists and a means of disseminating tourist revenue more widely throughout the country they would be eminently worth while. But their greatest value and the most important reason for setting them aside must be their benefit to Canadians themselves. Deep down in every man is the craving for the beauty of nature and for the freedom of life in the out of doors. The cramped life of city workers, their insufficient opportunities for vigorous play in the open are resulting in a lowering of vitality that must in the end weaken the fibre of the race. Mr. Herbert Hoover in a report to the Federation of American Engineers, recently pointed out

the immense waste due to preventable diseases. He estimated the economic loss on this continent at over three billions, three hundred millions, approximately two billions of which is among those gainfully employed. The chief source of this loss arises from what is known as degenerative diseases, or diseases that are fundamentally due to a lack of vitality. The changes in human environment since the introduction of machinery have been so rapid and so sweeping that the human organization has not yet learned how to adapt itself to the new conditions. Yet the long history of the processes of nature shows that the species which fails to adapt itself to a changing environment inevitably goes under. There is no question of more fundamental national importance than the maintenance of the vitality and virility of the race and everything that contributes to that end must constitute a sound national policy.

As a first step in the programme of extension of national parks to the East it has been suggested that an area of sufficient size in the Laurentian region within reach of the large centres of population of Eastern Canada should be devoted to this purpose. The commercial benefit to the country would be very considerable on account of the tourist revenue that would result but the benefit to city workers who could reach a reservation of this kind in a few hours time would be of far greater importance.

It is also very desirable that areas should be set aside in the Maritime Provinces at an early date including some part of the beautiful sea coast and the original forest if any area where this remains can be secured.

PUBLICITY DIVISION

For the first time since the outbreak of the war it was possible to devote part of the appropriation to publicity. This was most necessary as our supply of literature of every kind was practically exhausted. A new and enlarged edition of the "Glaciers of the Rockies and Selkirks", by Prof. A. P. Coleman, was issued and distributed and an attractive descriptive guide to the parks along the Canadian Pacific main line entitled, "Through the Heart of the Rockies and Selkirks", was published. Material was also collected for other necessary publications including a small pocket information folder on the Banff park, intended chiefly for motorists.

During the Winter Carnival at Ottawa in January a large exhibit was prepared and placed in the entrance hall of the Central Station. It consisted of a large painted drop of Mount Edith Cavell, Jasper park, with a miniature forest in the foreground disclosing a tepee beside a camp-fire which by an ingenious arrangement of chemicals appeared to give off real smoke. The reverse side of the exhibit was filled in by a large panel in which was inserted a beautifully painted transparency of the globe with the legend "Canada's National Parks the Playground of the World". This was flanked by two columns in which transparencies of striking park scenes were inserted. A fine specimen of a mounted buffalo completed the exhibit, which attracted a constant stream of visitors throughout the carnival and elicited much favourable comment.

A somewhat similar exhibit on a smaller scale was also sent to California and was shown in several of the principal coast cities and also in Vancouver. The interest in the Canadian National Parks created by this exhibit led to many inquiries and requests for literature and a number of parties including the Seattle Alpine Club arranged for a trip to Jasper National park as a result. Arrangements were also made whereby moving picture films of some of the mountain parks were shown at several of the Pacific coast theatres and the cordial co-operation of the officers of a number of prominent educational organizations and institutions, such as the California Audubon Society and the universities of California and Southern California, who arranged to show slides and plans of the Canadian parks in connection with their work, was secured.

Through the courtesy of the Exhibition Branch, Department of Agriculture, a special display of National Park scenes was also shown in connection with the Southern Florida Exposition at Tampa, thereby reaching another large section of the wealthy travelling class.

A series of illustrated lectures on the national parks was given in western Ontario during the late winter and spring months by Captain F. G. Forster, B.A., whose services were loaned to this Branch by the Soldiers Settlement Board. Captain Forster appeared before numerous educational and other organizations and showed films of the scenery, the wild life, the government buffalo herd at Wainwright and the bird sanctuaries, reaching, it is estimated, about 60,000 persons.

Several thousand lantern slides, with accompanying lecture notes, were set out in response to requests for prepared lectures from Canada, England, the United States and even Australia.

HISTORIC AND PREHISTORIC SITES

In connection with the work of marking and preserving historic and prehistoric sites of national importance, very satisfactory progress was made. One general meeting of the Historic Sites and Monuments Board, which acts in an advisory capacity to the department in connection with this work, was held at which all sites under consideration were reviewed with the object of defining their importance from a national point of view. Requests for the co-operation of provincial and local historical societies and associations which are interested in the preservation of Dominion landmarks met with favourable response and 40 of these are at present assisting in the national work.

An artistic design for a tablet, emblematic of Canadian history, has been purchased from the well known Canadian artist, Major Ernest Fosberry, R.C.A. These tablets are now being cast in bronze and will be used in connection with the marking of the above sites.

Cairns of attractive design, constructed of rough field stones, will be erected on several sites, to carry the standard bronze tablet. Where these are not suitable it is proposed to erect monuments. A competition for designs for suitable types of landmarks has been organized and is at present being carried out.

An educational campaign is being carried on relative to the various sites selected for action, with a view to stimulating public interest and creating a national consciousness with respect to the important events connected with Canadian history. Small pamphlets have been published and are available for distribution containing a history of the sites of Fort Anne, Fort Lennox, Fort Chambly, and Port Dover. Others will be prepared and published as the work progresses. Copies may be had upon application to the Commissioner, Canadian National Parks, Ottawa.

The attention of the department has already been called to 610 sites and 82 have been selected to receive immediate attention. In the last report the steps that had been taken with regard to a number of these were reviewed. The following shows the additional action taken this year:—

*Maritime Provinces**

Louisburg, N.S.—Area approximately 90 acres. Ruins of old French fort, built in 1720-40, once the stronghold of France at the threshold of the continent, played an important part in the events which led to withdrawal of French rule from Canada. A survey of the site has been carried out by the Department of Railways and Canals which has furnished this department with the returns and plans and has promised to transfer to the control of this department an area of approximately 60 acres which is at present under their control.

*Where historical details of site were given last year these are not repeated.

Fort Edward, Windsor, N.S.—Area 27 acres. Transferred by Order in Council from the Department of Militia and Defence for preservation and restoration. The remains include the original blockhouse still intact and the ruins of the officers' quarters, recently partially destroyed by fire. A part-time caretaker has been appointed.

Fort Moncton, about one and a half miles from Fort Elgin, N.B.—The site is privately owned but as the proprietor is averse to disposing of it, it has been decided to place the memorial on the property owned by the Department of Marine and Fisheries, permission to this end having been secured.

De la Verendrye, Three Rivers, P.Q.—Pierre Gauthier de Varennes, son of the Governor of Three Rivers, was born at that place November 18, 1685, and saw service in France during the war of the Spanish Succession. He returned to Canada in 1712 under the name of la Verendrye, and established a fur trade on the St. Maurice river. In 1727, he was sent to take charge of a trading post at lake Nipigon and later undertook an expedition to discover what he called the "Pacific Ocean." In 1737 he built a fort at Portage la Prairie (Manitoba), from which several campaigns of exploration were carried out as far as the Rocky mountains. He was recalled in 1744 and died at Montreal in 1747, while preparing a further expedition to the Northwest. The remains of the foundations of his birthplace, situated in a beautiful park overlooking the St. Lawrence river, in the city of Three Rivers, are still visible and an appropriate tablet has been placed on one of the pillars supporting the iron railing which surrounds the park.

Fort Lennox, Ile-aux-Noix, P.Q.—One of the forts which formed the line of defence in the Richelieu valley. Remains consist of earthworks and a number of well preserved buildings. This was a massive old fortress situated about 12 miles below the outfall of lake Champlain in the Richelieu river and 10 miles from the Canada-United States border. It was built in 1609 by the French and famous in the conflicts of 1760, 1775, and 1812. It continued to be garrisoned until the withdrawal of the Imperial troops in 1869. On May 18, 1921, the site, comprising 5 islands and covering an area of approximately 210 acres, together with the buildings thereon, was transferred from the Department of Militia and Defence to the Department of the Interior for preservation and restoration. A custodian has been appointed to keep the property in order, and a museum opened in the fort wherein have been placed Indian relics, military buttons, bayonets, crests, badges, and plates, etc., silver and copper coins, etc. A pamphlet recently published containing a full history of the fort may be obtained upon application.

Fort Chambly, Chambly, P.Q.—One of the most venerable and picturesque ruins on the American continent. Built of palisades in 1665; burnt by Iroquois in 1702. Rebuilt of stone 1709-1711. Taken by the Americans in 1775, and interior buildings burnt in 1776. Restored in 1777; abandoned definitely in 1850. The site was transferred to the Department of the Interior in 1921. Steps have been taken to arrest the disintegration of the massive walls, and to redeem the cemetery from neglect and decay. A valuable museum containing articles of rare interest has been added to the fort. A pamphlet has been prepared containing complete data and information relative to the fort which may be secured upon application.

Fort Laprairie, Laprairie, Quebec.—Built in 1687, the scene of an unsuccessful attack by New England States Militia troops in 1691. The fort was a refuge for the inhabitants during the wars of 1687-1713. It is proposed to erect a monument and tablet in a public park known as Foch square, the necessary lease of occupation having been executed with the municipal authorities for the required area.

Duluth's Birthplace, Montreal, P.Q.—Corner of St. Paul Street and Place Jacques Cartier, Montreal. Site of residence of Daniel Greysolon Duluth, who

died February, 25, 1710. One of the explorers of the Upper Mississippi, after whom the city of Duluth was named. A marble tablet has already been erected in commemoration of his services to the Dominion on the building at the intersection of the above streets.

Eastern Ontario

Glengarry House, Ont.—Site of the residence of Lt.-Col. John McDonnell, a noted pioneer in the settlement of the province, first speaker of the Legislative Assembly of Upper Canada and commanding officer of the 2nd Battalion, Royal Canadian Volunteers 1796-1801. Situated some 200 yards from the main highway, near Cornwall. Only ruins of walls remain. A cairn with a commemorative tablet is to be erected on the site, which has been donated for this purpose by Mrs. Annie J. Craig, the present owner.

Chrysler's Farm, Ont.—Situated about 5 miles east of Morrisburg, adjacent to the Montreal-Toronto highway. A monument consisting of an obelisk, on either side of which are two guns, was erected in 1895 by the Dominion Government to commemorate the victory over invading United States forces at the battle of Chrysler's Farm, November 11, 1813. This site, comprising an area of .23 acre which is enclosed with a chain fence, has been transferred to the control of this department by the Department of Militia and Defence.

Western Ontario

Mission of Ste. Marie II, Christian Island, Ont.—Situated near Penetanguishene, on an Ojibway Indian reserve. The Indians by resolution, have granted this department permission to carry on the proposed work of restoration, etc. This second fort, of stone, 72 feet square, flanked by four bastions, was burnt in 1649 by the missionaries after the burning of Ste. Marie I (which was on the Wye river near Midland, Ontario), and was evacuated on June 10, 1650. The ruins are to-day easily traceable though much overgrown with trees and brush. A memorial tablet will be placed on the site and the property cleared, drained and fenced.

Port Dover (Site of the Cross) "Cliff Site".—Situated in the village of Port Dover on a flat-topped point of land where the river Lynn enters lake Erie on property owned by the Grand Trunk Railway Company, which has signed a lease of occupation covering an area of .17 of an acre. An artificial stone cross, 16 feet high, has been erected to signalize the taking possession, in the name of King Louis XIV of France, of the lands of the lake Erie region by the Sulpician priests, Dollier and Galinee, on March 23, 1670, during the exploration of the Great Lakes. A commemorative tablet is to be placed on the pedestal of the cross and the site enclosed with an artistically designed fence. A pamphlet recently published containing a history of the site may be obtained upon application.

Port Dover, Ont., "Wintering Site".—Situated about three-quarters of a mile from the "Cliff Site" at the mouth of Black creek on property owned by Mr. A. Ansley. Site of the wintering place of Dollier and Galinee and seven other Frenchmen in 1669-1670. An area, on which a cairn with a commemorative tablet will be erected, has been donated to the department by Mr. Ansley.

Niagara Front

The historic sites of national significance along this front between lake Erie and lake Ontario have already been fairly well indicated by the erection of markers or tablets. It has been decided to carry out the completion of this work by taking action in regard to the following sites:—

Chippewa.—The most ancient village on the Canadian frontier. Situated on the south side of Chippewa creek in an open field near Niagara Falls. Scene of a desperate fight on July 5, 1814, between Canadian and United States troops, with serious losses of men on both sides. A monument is being constructed by the Niagara Falls Park Commission adjacent to the main boulevard on which one of the department's standard commemorative tablets will be placed.

Frenchman's Creek.—Situated near Bridgeburg. Site of the action of November 27, 1812, between Canadian and United States troops, also of landing place of Fenians, May 31, 1866. It is proposed to place a commemorative tablet in honour of the officers and men of the Royal Artillery, 19th Regiment, and Norfolk Militia, killed in this action, on a monument which is being erected by the Niagara Falls Park Commission.

Vrooman's Battery.—A suitable standard is being erected by the Niagara Falls Park Commission on which a commemorative tablet will be affixed.

Battle of Cook's Mills.—A monument and tablet, enclosed by an appropriately designed fence, will be erected on the site which has been donated by Mr. Roy Matthews.

Battlefield of Fort George.—Situated outside the town of Niagara. Landing place of invading United States troops and battle of May 27, 1813, resulting in the capture of Fort George. A plot of land 25 feet square on the military property at Fort Mississagua has been transferred from the Department of Militia and Defence to the control of this department. A monument and commemorative tablet will be erected.

Battlefield of Beechwoods or Beaver Dam.—Situated on the Mountain road near Thorold. Site of the action of June 24, 1813, between the invading United States troops and Canadian troops, the former being dispersed with heavy losses. A site has been donated by Mr. R. L. Peek, and a monument and tablet will be erected.

Site of Tete du Pont Battery.—Situated on Hog island at the mouth of the Chippewa river. Permission for the erection of a stone marker has been secured from the council of Chippewa, but action was deferred until the completion of the Hydro-Electric power canal on the island.

Sault Ste. Marie, Ont. (Lock Site).—Constructed by the Northwest Fur Company in 1797 and destroyed in July, 1814, by a force of United States troops. A portion of the old lock was uncovered in 1889 and later it was rebuilt of stone. A monument and tablet will be placed on the site, which is owned by the Lake Superior Paper Company, who have executed a lease of occupation covering the land.

Turkey Point.—Situated about 3 miles east of Port Rowan. To commemorate the encampment of Dollier and Galinee, in March, 1670; the passage of Major Gladwin and Sir William Johnson to obtain a treaty with the Indians in 1761; and of occupation by the British in war of 1812-14. A site for a monument and tablet has been selected on the reserve of Ordnance lands near the lakeside.

Glengarry Landing.—Situated between Minesing and Edenvale. Here Lt.-Col. Robert McDouall built the flotilla of boats with which he effected the relief of the British garrison at Fort Mackinac in May, 1814. Owing to its remote location, permission has been secured from the county council of Simcoe for the erection of a suitably inscribed stone marker near Edenvale bridge on the main travelled road.

WORK FOR THE FUTURE

The following historic sites have been transferred to the jurisdiction of this branch and will be suitably marked during coming seasons:—

Maritime Provinces

Fort Cumberland
Battle Ground of Grand Pré

Quebec

Battle Ground of Laprairie (2nd battle)
St. Maurice Forges
Battle Ground of Three Rivers
Fort Laprairie
Gaspé
Jacques Cartier Landing
Fort Remy
Fort Sorel
Fort Longueuil
Fort Gentilly
Fort Cuillerier
Fort Rolland
Fort Verdun
Fort Senneville
Fort Charlesbourg
Arbre-a-la-Croix
Tadoussac
Battle Ground of Riviere des Prairies
Site of Three Rivers Massacre
Three Rivers Platon and Fort
Fort St. John

Eastern Ontario

Old Simcoe Building, Kingston
Windmill Point
Glengarry Cairn

Western Ontario

Mission of St. Ignace
Weishuhn's Redoubt
Navy Island Shipyard
Port Arthur
Fort William
Fort Nottawasaga
Brock's Route, Port Dover to Detroit
Battle Ground of Moraviantown
Battle of the Longwoods
Fort St. Joe

Western Canada

Northwest Rebellion.—It has been recommended that the following sites, all in the province of Saskatchewan, connected with the rebellion, of 1885, should be marked:—

Batoche.—On the South Saskatchewan river between Prince Albert and Saskatoon.

Duck Lake.—About five miles northwest of Batoche.

Battle of Fish Creek.—Situated about ten miles from Batoche.

Clark's Crossing, now Clarkboro.—About nine miles from Saskatoon.

Battleford.—First seat of government of the Northwest Territories.

Cut Knife Hill.—About thirty miles west of Battleford.

Fort Pitt.—On the Saskatchewan river near Lloydminster.

Frog Lake.—About thirty miles from Fort Pitt.

Fort Prince of Wales, Manitoba.—Situated at Churchill, Manitoba. The most northerly fortress on the American continent. Built by the Hudson's Bay Company from 1733 to 1747. Destroyed by the French and never rebuilt. Within the ruined walls are 38 old guns and the remains of the factor's residence. By Order in Council of February 21, 1922, an area of 50 acres, on which the fort is situated, at the mouth of the Churchill river, was reserved for historic memorial purposes. Two enamelled signs have been affixed to the walls of the fort, announcing that it has been created a national historic site and forbidding the removal of any of the remains.

Fort Livingstone, Manitoba.—Situated on section 5, township 34, range 32, west of the Principal meridian near Swan river. Old Royal Northwest Mounted Police post and seat of government for the Northwest Territories. The site has been acquired for proper marking.

APPENDIX No. 1

REPORT OF THE SUPERINTENDENT OF ROCKY MOUNTAINS PARK, R. S. STRONACH, BANFF, ALBERTA

During the past season a right of way for an auto road around the animal paddocks was cut out and enough grading done to allow automobiles to make a circular trip. In this way much better views can be obtained of the different animals. These facilities have proved very popular with the thousands of visitors who find the animal enclosures one of the finest attractions in the park.

Three Rocky Mountain goats and one Rocky Mountain sheep were captured and added to the herds. In addition to these "Banff," the bull moose that escaped some years ago, returned and now seems to be quite at home.

The following is a list of the animals now in the enclosure: 7 buffalo bulls, 5 buffalo cows, 1 bull moose, 1 cow moose, 15 bull elk, 15 cow elk, 1 Persian ewe, 33 Angora rams, 33 Angora ewes, 9 Rocky Mountain rams, 7 Rocky Mountain ewes, 3 Rocky Mountain billy goats, 2 Rocky Mountain nanny goats, 3 bull yaks, 3 cow yaks.

The following animals were donated to other parks during the past season: City of Calgary, Alberta, 1 buck mule deer; Department of Agriculture, Dixon, Montana, U.S.A., 4 Rocky Mountain rams, 8 Rocky Mountain ewes; Buffalo Park, Wainwright, Alberta, 19 yaks; National Zoological Park, Washington, U.S.A., 1 bull yak; Zoological gardens, San Antonio, Texas, U.S.A., 1 Rocky Mountain ewe.

Government Baths.—The Government baths of the Upper Hot Springs and the Cave and Basin, still maintain their position as one of the most important attractions. Many times during the summer season the accommodation at the Cave and Basin was taxed to its limit. The total attendance was less than the previous year, but this is partially explained by the extremely cold weather experienced this winter (1921-22) which cut down the number of winter bathers. The attendance at the Upper Hot Springs also dropped off a little owing to the severe weather, whereas during the summer the number of bathers showed an increase.

The numbers of bathers at the two establishments were as follows: Cave and Basin, 41,675; Upper Hot Springs, 23,625. The places of residence of bathers at the Upper Hot Springs were: Canada, 23,364; United States, 212; England, 20; Ireland, 9; Scotland, 14; Australia, 6.

The receipts at the bath-houses for the year were: Cave and Basin, $10,403.35; Upper Hot Springs, $5,831.55.

The cave at the Cave and Basin proved very popular, approximately 25,000 visitors registering during the season.

Camping Ground.—The public camping ground, which is situated amid surroundings of unsurpassed beauty near the Bow falls and supplied with good running water and sanitary facilities, is being patronized more and more each year by motor parties who visit the park.

The camp site has been in existence five years and the camping permits each year have steadily increased as the figures below show. The large majority of these visitors are Canadians. Following are the numbers in the fiscal years ended on March 31 in the year named: 1918, 73; 1919, 57; 1920, 77; 1921, 200; 1922, 338.

Fishing.—Excellent fishing was obtained last season in nearly all the lakes and streams in the park and no difficulty was experienced in catching the maximum allowed for one day.

The Dominion fish hatchery at Banff continued its good work, a greater number of game fish being hatched out and liberated than in any previous year. The following fry were liberated during the season: Salmon trout, 136,756; Atlantic salmon, 133,600; rainbow trout, 649,752; cut-throat (or red-throat) trout, 318,825. In addition, 60,725 cut-throat trout were liberated in the Spray lakes from the Spray Lakes hatchery. Visitors to the number of 3,987 registered at the hatchery at Banff.

Forest Fires.—During the season there were 24 forest fires. Seven of these were started by sparks from passing engines. The only fire which could be considered of a serious nature occurred on June 23 on the northern slopes of Rundle mountain, giving the warden staff considerable trouble and burning over approximately 150 acres of land before it could be got under control.

Fire Fighting Equipment.—During the season a fire truck was added to the fire-fighting equipment, and has already proved of great value.

Game Protection.—No infractions of the game laws were recorded during the season.

Golf Course.—The new course has been finished with the exception of a few bunkers on the old part of the course, which, if constructed, would have interfered with the use of that course. The old road which cut across the course was all filled in and seeded and the Loop Drive diversion, to avoid the new course, completed.

Health.—Health conditions were exceptionally good in the park during the past year. There were no epidemics and very few cases of infectious or contagious diseases. All dairy cows were again tested for tuberculosis by an officer of the Department of Agriculture, assisted by our inspector. Only one animal which reacted to the test was found in the park, which indicates the healthy condition of the herd supplying milk to the residents of the different Government townsites.

Motor Traffic.—The popularity of the motor trip from Calgary to Banff is indicated by the large increase in the number of cars passing through the eastern entrance to the park. During the year, 3,492 cars entered by way of Kananaskis carrying approximately 15,000 persons. The following is a summary of the places from which these cars came: Calgary, 2,235; other points in Alberta, 890; other points in Canada, 216; United States, 151.

Museum.—During the season a large number of tourists visited the museum and a number made use of the collections for identification purposes. The following birds and mammals were added during the year: Richardson's grouse, baldpate duck, water ousel, Canada jay, Clarke nutcracker, Hungarian partridge, skunk. In addition to these specimens a number of rare insects, spiders and butterflies were procured, also certain plants as well as fossils and rocks, specimens of which were missing from our collections.

Plants.—Owing to the fact that climatic conditions were favourable for plant growth, flowers and plants peculiar to the mountains were much more numerous than during the previous year and some very good specimens were obtained for the museum and by visiting botanists. Prof. R. B. Thompson and Prof. E. M. Walker of the University of Toronto, and Dr. F. J. Lewis of the University of Alberta, spent several days collecting and were successful in obtaining some rare specimens.

Birds.—Mr. J. A. Munroe, Chief Migratory Bird Officer for the Western Provinces, spent some weeks in Banff during the winter months and much valuable information was obtained from him concerning the increase of bird life in the park and also with regard to the classification of the specimens in the museum.

Building Permits.—During the year 49 building permits were issued, the estimated cost of the work covered by these permits amounting to $121,075.

Grazing Permits.—Seventy-three grazing permits were issued, covering the grazing of 323 cows, and 432 horses. The number of animals covered by these permits shows a large increase over the number for which permits were issued during the previous year.

Timber Permits.—The number of permits issued to residents for the cutting of dry wood in the vicinity of Banff totalled 62, covering approximately 350 cords of firewood. Twenty-six permits covering quarter sections were also issued and approximately 3,000 cords of timber were cut on these areas.

Roads and Bridges.—A very extensive programme for the maintenance of roads and bridges was undertaken and the results obtained were very satisfactory. Four road gangs were employed during the summer months. During the season the Castle-Lake Louise Highway was opened to motor traffic and soon became very popular. In addition to the gangs mentioned above, two sectionmen were stationed at points approximately ten miles apart on all the roads, and by their efforts the highways were maintained in an excellent state of repair. During the winter months gangs were employed on the Banff-Castle road and the Tunnel Mountain drive blasting away points of rock, etc.

The new bridge over the Bow river at Banff was completed during the summer months and now constitutes one of the most attractive highway bridges in Canada. A new bridge over the Cascade river near Anthracite was also finished in the early summer months opening up to the motorist one of the most beautiful spots, from a scenic standpoint, in the park.

Telephones.—With the completion of the remodelling of the Banff telephone system it was extremely difficult to keep up with the applications for telephone service, as the system practically doubled during the season. The system is now a very efficient one.

Banff Townsite.—The usual general maintenance work on the streets of Banff was carried on and in addition all streets of Banff were given a coat of asphaltic oil. The new diversion from Lynx street to the Banff-Castle highway was completed. The demand for building lots in Banff is becoming greater each year.

A new covered curling rink was erected on the Recreation Grounds, and a most successful bonspiel was held in February.

Canmore Townsite.—Work on the new lighting system was started in the late fall and completed about the first of January. Service is now being given to approximately 70 of the residences and applications for service are still being received.

Lake Louise Townsite.—Although applications have been filed for lots in this townsite no active building has yet been started. It is expected, however, that some building will be undertaken during the coming season as the number of tourists to this section of the park has increased greatly since the road between Banff and Lake Louise was opened to motor traffic.

Trails.—The following new trails were constructed: trail from Bryant creek along Marvel lake over Wonder pass to mount Assiniboine, a distance of 5 miles: trail from the mouth of Bryant creek to Whiteman's pass along Whiteman's creek, a distance of 8 miles; trail from the Red Deer summit down the Red Deer river to Scotch Camp, a distance of 16 miles; trail from Scotch camp to Windy camp on the Panther river, a distance of 15 miles.

Visitors.—In the month of April their Excellencies, the Duke and Duchess of Devonshire accompanied by certain members of their family and suite, paid their farewell visit to Banff. They remained three days before resuming their journey to the coast.

Waterworks.—During the winter months of 1920-21 a new dam at the intake works was completed. It is expected that many of the difficulties experienced when the old dam was in use will now be entirely eliminated.

Zoo.—Great interest was taken in the Zoo last season by tourists. It was not an uncommon sight to see from 100 to 150 people congregated around the cages during feeding hours. A number of valuable specimens were procured during the year, the most important of which were: 1 pair mountain lions, 1 green monkey, 1 vervet monkey, 4 Rhesus monkeys, 1 pair timber wolf pups, 1 pair coyote pups, family of skunks, 1 pair Amherst pheasants, 1 pair Chinese pheasants, 1 pair Mongolian pheasants, 1 pair prairie chickens, 1 golden eagle.

Winter Carnival.—The Winter Carnival was held in Banff during the week commencing January 30. Weather conditions were ideal during the latter part of the week and large and enthusiastic crowds watched the different events.

APPENDIX No. 1a

VISITORS TO ROCKY MOUNTAINS PARK FROM APRIL 1, 1921 TO MARCH 31, 1922

HOTEL REGISTRATIONS

Hotel	Home Country of Visitors				Conducted Parties	Total
	Canada	United States	British Isles	Other countries		
Banff Springs Hotel, Banff	2,824	9,225	434	407	89	12,979
Chateau Lake Louise, Lake Louise	2,265	12,463	344	422	320	15,814
King Edward Hotel, Banff	2,995	336	255	83	.....	3,669
Bretton Hall, Banff	2,191	604	58	42	.....	2,895
Mount Royal Hotel, Banff	1,215	1,052	.....	495	.....	2,762
Homestead Hotel, Banff	1,463	311	23	19	.....	1,816
Alberta Hotel	983	203	.....	14	.....	1,200
Hot Springs Hotel, Banff	387	15	.....	3	.....	405
	14,323	24,209	1,114	1,485	409	41,540

SUMMARY

Total hotel registrations	41,540
Summer cottagers, guests at boarding houses and campers (estimated)	6,000
Motorists	15,000
Excursionists	9,000
Grand total	71,540

APPENDIX No. 1b

The Alpine Club of Canada

(Report prepared by the Secretary)

The club house had a very successful season and was never without guests during the entire summer, some making long stays. As usual it was the rendezvous of very many strangers seeking information about the Canadian mountain regions—information which is apparently available nowhere else. Such visitors are gladly welcomed as it is one of the main objects of the club to make the mountain regions of Canada known to all the world.

The usual local climbs were made. Miss Gold and Messrs. West and Wates climbed mount Edith. They experienced no difficulty and had an enjoyable time. Dr. Hickson, Mr. L. S. Crosby and Mr. Edouard Feuz made the first ascent of the pinnacle beyond mount Louis which has been an object of interest to climbers for some time. It proved a fine rock climb. Later on Mr. Morrow made the ascent of one of the Three Sisters at Canmore.

An added attraction to the building was the installation of the bath system so kindly subscribed for by the overseas members.

Mr. A. L. Mumm, a life member and vice-president of the English Alpine Club, gave a number of magnificent photographic enlargements of views of the mount Assiniboine country. These are framed and hang in the dining room together with the mount Robson pictures by the same artist. As all the pictures in the dining room are by him it is named the Mumm collection. Mr. W. D. Wilcox presented a set of his beautiful pictures of the mountains.

Professor Charles E. Fay, another honorary member, presented the club with the ice axe of Peter Sarbach, bearing the following inscription: "This axe was the property of Peter Sarbach, the first Swiss guide in the Rockies, in 1897. On the breaking of the shaft of the Appalachian mountain club axe, Sarbach loaned it to C. E. Fay, who used it for the first ascents of mount Lefroy (August 3), mount Victoria (August 5) and mount Gordon (August 10)." The club will keep this axe in the Banff club house where all may see the trophy of an earlier day so graciously given by our old friend. The visitors to the club house came from all over Canada and the United States as well as the United Kingdom of Great Britain and Ireland.

Report of the Annual Camp at Lake O'Hara

(Prepared by the Secretary)

The sixteenth annual camp of the Alpine Club of Canada was held in the meadows near lake O'Hara from July 26 to August 6. It is a curious coincidence that four camps have been held in this neighbourhood at intervals of four years. In 1909 we met on the same site and enjoyed perhaps the most success-ful of any of our camps. That year the British association met in Winnipeg and the club extended an invitation to twenty British mountaineers. The veteran, Edward Whymper, was there and many others, several of whom have repeated their visits to our great pleasure.

This year an invitation was extended to the veteran climbers in the Canadian Alps from the United States. Our honorary member, Professor Charles E. Fay,

organized the representation and if the fates were against his success in gathering together all whom we might have wished to see, the attendance was fit though few. There were present besides Professor Fay himself, Rev. Dr. H. P. Nichols of New York, Mr. B. S. Comstock of South Orange and Mr. W. D. Wilcox of Washington. The "Rockies of Canada" by Mr. Wilcox is well known and his wonderful photographs of the Canadian Rockies are admired wherever they are seen.

No more fascinating camp site can be found in the mountains. Lake O'Hara won the heart of the great painter Sargent, who declared it the most beautiful lake he had ever seen. To appreciate it fully it has to be lived with and seen in every light—in sunshine and in storm.

The weather afforded all varieties of condition, from warm summer to snow, but as a matter of fact, there were only two bad days. The accident to Dr. Stone cast a shadow over the camp and necessitated taking away one of the Swiss guides, thus curtailing the more serious climbing, although all the newcomers who wished were able to graduate.

The camp was a fine centre for excursions and climbs of all kinds of difficulty. The famous two-day expedition was repeated four times. Leaving O'Hara in the morning, Abbot pass, the Victoria and Lefroy glaciers, and Mitre pass were crossed to Paradise valley, where the night was spent in a comfortable bivouac camp. Next day, by way of the Wastach, Wenkchemna, and Opabin passes and glaciers, O'Hara was again reached. There is probably no other expedition in the mountains which reveals the heart of things so fully with so little labour.

Mount Odaray was the qualifying climb and found to be of great interest. Huber which was the graduating climb in 1909 was in no fit condition.

A new policy, as outlined in the circular, was developed which was found to work admirably. Before inexperienced members were allowed to attempt the graduating climb they were sent on preparatory instructive climbs and according to reports of their fitness were permitted to attempt graduation. No one more appreciated the advantages of this scheme than the novice himself, and the knowledge thus acquired made his test climb a thing of joy.

The most valuable training climbs were the Opabin pass and mount Wiwaxy. On the latter some very interesting rock work can be obtained. In addition to mounts Odaray and Wiwaxy, climbs were made of mounts Victoria, Schaeffer, Yukness, and Park mountain. The last was found to be by no means as easy as anticipated. One party came into camp from Field by way of Duchesnay pass and did not think the interest equalled the labour. A trip, as in 1913, was made to lake Linda under the kindly guidance of Professor Fay and as in 1913 was a little late in returning.

The camp fires were as enjoyable as ever and the reminiscences of the pioneers were of the utmost interest. The lovely voice of Mrs. Burnett will linger long in the memory of those who heard it. There were 157 placed under canvas, among them representatives of the Alpine club (England), the American and Swiss Alpine clubs, the Appalachian Mountain club, the Green Mountain club, the Sierra club, and the Royal Geographical Society.

Those present were drawn from the following: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, England, California, Connecticut, District of Columbia, Massachusetts, Michigan, Minnesota, New Jersey, New York, and Pennsylvania.

APPENDIX No. 2

REPORT OF THE SUPERINTENDENT OF YOHO AND GLACIER PARKS, E. N. RUSSELL, FIELD, B.C.

The first work of the fiscal year was in and around the townsite of Field. Streets were repaired and put in shape as also were the plank sidewalks in the townsite. Permanent approaches were put in at each end of the new bridge over the Kicking Horse river at Field.

Road repairs were commenced as soon as possible in the spring, when the Yoho, Emerald lake, Hector, and Ottertail roads were thoroughly gone over and put into good condition. This year, for the first time in this park, motor trucks were used by the department in connection with road work. They proved most useful and enabled the handling of the major portion of road repairs from town, in place of having to establish small temporary camps a few miles out, thus saving the overhead charges necessary to the running of a camp.

Yoho Park.—A good deal of work was done on the park trails in addition to the general repairs which are made almost daily by the wardens in the course of their patrols. The major portion of the trail repairs this year were in the vicinity of Field and Wapta Camp, as owing to the Alpine club camp this year at lake O'Hara there was more travel on these trails than usual.

During the summer months a new garage and implement house was constructed in the townsite of Field to house park cars and other equipment. Two new streets were opened up in the townsite on the area recently taken over from the Canadian Pacific Railway Company and it is anticipated that the lots on this area will shortly be made available for application.

The stocking of the waters in the park with suitable fish was continued again this year: 25,000 rainbow trout were placed in Wapta lake, 25,000 in Emerald lake and 20,000 in Sherbrooke lake. Wapta lake was suitably screened at the outlet by the Canadian Pacific Railway to prevent the young fish from going down the waters of the Kicking Horse river. In previous years both Wapta and Emerald lakes had been stocked with cutthroat (or red-throat) trout but after a thorough examination of the waters the feeding grounds and general conditions by officers of the Dominion fish hatchery at Banff, the rainbow trout were considered to be better adapted to these waters and it is anticipated that in a few years the results of this stocking will be noticeable.

Game of all kinds is increasing by leaps and bounds in the park. It is now barely two years since total protection of game was begun and the game placed under the control of the Dominion Government and subject to the park regulations; and, whereas two years ago the larger kinds of game were rarely seen in the park, now they are an every day sight. Moose are particularly plentiful and frequent the flats around Ottertail and Leanchoil in great numbers, while deer are frequently seen in herds of from eight to twelve. Goat and bear are also numerous, in fact the warden service has had to dispose of several bears which at different times became a nuisance, hanging around camps or settlements for the garbage they were able to obtain. Elk and sheep have been seen in the park during the past season but these probably came in from the Rocky Mountains park and more than likely returned there again.

There was only one small forest fire caused by lightning, near the ten mile post in the Yoho valley, in which there was no destruction to timber. No railway fires occurred within the boundaries of the park and apparently the educational propaganda conducted by the department for a number of years past is now having its effect.

The number of tourists visiting the park this year was up to the maximum of the accommodation and many had to be turned away for lack of a place to stay. The Railway Company are, however, increasing their accommodation considerably for next year. Additions were made to the Emerald Lake Chalet during the winter months which will increase the accommodation from thirty to approximately one hundred guests. A large room has been built which can be used for dancing or similar purposes, and modern plumbing has been installed throughout the buildings. Permanent camps are being established by the Canadian Pacific Railway at lake O'Hara and in the Yoho valley while a half way camp is to be established at Summit lake. There will thus be a series of hotels or camps dotted about the park. Visitors at Emerald Lake Chalet totalled 1,110 of whom 212 were Canadians, 801 came from the United States, and 97 from other countries.

Revenue returns in this park, will show an advance over those of last year of about 50 per cent. This is principally due to the increase in the amount of dead timber being removed from the park.

Glacier Park.—Work in this park commenced with the repairing of the road from Glacier station to the Glacier hotel, after which the road to the Nakimu caves was opened up and the new road to Rogers pass from the hotel completed. Motor cars were used for the first time on these roads and greatly facilitated the handling of passengers between the station and the hotel. A sight-seeing car was run between Glacier and Rogers pass making daily trips which proved very popular on account of the magnificent scenery that can be viewed from almost any point along this route.

On trails a considerable amount of repair work was done. There are now approximately 115 miles of trails in this park, the majority of which are in first class condition.

A new trail was constructed between Flat creek and Glacier along the Illecillewaet valley, a distance of about seven miles. The work of making an accurate measurement of the length of all trails and posting up the mileage at each mile has been begun.

At the Nakimu caves, the development work started last year was continued with good results. The caves from No. 4 entrance were further explored and a considerable additional distance was made accessible to the public by the construction of a series of stairways, cement walks, handrails, etc. A record number of visitors was shown through the caves. The number becomes greater each year as the caves become better known and more fully developed.

There was only one small fire in the park which was started by lightning not very far from the hotel and caused the guests there to spend a few anxious moments. The wardens were, however, quickly on the spot with a gang of fire-fighters, and it was not long before they were able to get it under control.

Game in this park, as in the Yoho, is on the increase, caribou being one of the most plentiful species. Two cases of infringement of the game regulations by trapping were taken up during the year and convictions secured in both.

Visitors at Glacier House totalled 3,223, of whom 300 were Canadians, 2,819 came from the United States, and 104 from other countries.

APPENDIX No. 3

REPORT OF THE SUPERINTENDENT OF MOUNT REVELSTOKE NATIONAL PARK, F. E. MAUNDER, REVELSTOKE, B.C.

The season's work commenced during the last week of April when a few men were set at work following up the melting snow in order to keep ditches and culverts open. This must be done every spring to prevent serious washouts on the park road. When the danger from washouts was over the sectionmen set about the cleaning of ditches and the surfacing of the roadbed with material from the banks. This work was carried on throughout the season and the road maintained in a fine condition. Citizens of Revelstoke came up in large numbers in their cars and derived much pleasure from the magnificent drive.

As soon too as the western road from Revelstoke to Sicamous and Vernon is completed, Revelstoke will have motor communication with the greater part of interior and southern British Columbia and large numbers of visitors will no doubt make the motor trip up the mountain to the park.

Trails.—The trail from Revelstoke to lakes Eva and Miller was gone over and repaired. A new trail was started from Greely creek, the end of the provincial wagon road, towards the north boundary of the park at Silver creek. The year's work represents about 7 miles and it is hoped to complete it by the fall of 1922. This will make it much easier to handle forest fires that may start on the eastern slope of the park.

The telephone line from Revelstoke was extended to Balsam cabin at the summit, so that the warden will be able to communicate directly with headquarters in case of an emergency.

Game.—There were no infractions of the game regulations during the year which seems to indicate that the majority of people recognize and appreciate the sanctuary conditions prevailing in the park. In consequence the wild life is becoming very tame. During the summer and fall months as many as two or three dozen partridges might be counted while making a trip up the auto road. Deer are also met with and during the winter have been observed wandering on the south slope of the park. There were also plenty of caribou tracks to be seen and it is believed that these animals are quite plentiful in the park though they roam chiefly on the highest parts.

Winter Sports.—The Eighth Annual Tournament of the Revelstoke Ski Club was held on the Ski hill, Revelstoke park, on February 7 and 8, 1922, and, as in past years, attracted numerous competitors and visitors from outside points. The new shelter on the ski grounds was very much appreciated both by the Ski Club and the citizens of the district at large, and it proved a great convenience to all.

APPENDIX No. 4

REPORT OF THE SUPERINTENDENT OF JASPER PARK, COL. S. M. ROGERS, JASPER, ALTA.

A standard trail was built between Sunwapta cabin on the Sunwapta branch of the Athabaska river over the Poboktan pass and down to Brazeau lake, thence following the Brazeau river to its junction with the Southesk river, a distance of 53½ miles. This opens up a most interesting scenic, fishing, and game area which in the past has been almost impossible of access, and adds to the park facilities in the way of fire and game protection.

The greater portion of the trail from Caledonia lake to Dorothy lake was completed and the remainder, about 4 miles, will be finished during 1922.

A standard trail was completed up Snake Indian river to Rock lake, approximately 35 miles, making accessible a very interesting area and much improving the fire-protective facilities.

Aerial Reconnaissance and Photography.—Through the co-operation of the Canadian Air Board the superintendent was enabled to take part as photographer in trial flights by aeroplane covering three days, under the pilotage of Major Croil, Air Superintendent at High River, Alberta. A number of photographs were secured, many of which are of areas hitherto inaccessible, and it was established that the district was favourable for flying operations, owing to the wide valleys and the absence of air pockets which often render mountain flying difficult and dangerous. It was also found that Jasper park offers exceptional facilities for water landing-places for hydro-aeroplanes, if such are used in the future operations in connection with fire protection and aerial photo-topography.

Forest and other fires.—Fire losses were very low, owing to an unusual amount of precipitation and extra care in safeguarding. There were 27 railway fires with a total damage of $53.75 and six general fires, causing a total damage of $50. The cost of fire-fighting was: railway fires, $173.59; general fires, $818.75; total, $1,292.34.

Roads.—General road maintenance work was successfully carried out by the resident engineer and much necessary data obtained for the future extension of work.

Visitors to Jasper Park.—During the past season approximately 7,000 people visited Jasper park.

His Excellency the Governor General and the Duchess of Devonshire paid a farewell visit to Jasper park accompanied by a large house party, the members of which were kind enough to express their interest in this park and the hope of returning in the near future for an extended stay.

Edmonton—Vancouver Motor Highway.—The pathfinding party organized in connection with the proposed highway made their reconnaissance trip from Edmonton, proceeding part way by motor car and then by train and railway speeder to Entrance where they crossed the Athabaska river to Parkgate on the abandoned right of way of the Grand Trunk Pacific Railway. From this point within the park they covered the abandoned right of way to Pocahontas on horseback, and railway speeders were furnished from there to Jasper. In the opinion of this large party, including provincial government engineers, it would be comparatively easy and economical to convert the abandoned rights of way into a good motor highway.

Game Animals in Jasper Park.—There is a continued and most satisfactory increase in game animals, though it is impossible to estimate numbers correctly, owing to the wide area their range covers and their continual movement to new feeding grounds. The herd of wapiti procured from Yellowstone National Park, United States, has increased most satisfactorily. It is considered that the original 85 on a conservative estimate, has increased to over 200. They are in splended condition and evidently find that this park affords good summer and winter feeding grounds.

Interprovincial Boundary Survey.—Two large parties working under Dominion and provincial authority carried out successfully the survey of the remainder of the line south of the Canadian National railway covering the Fortress lake, Whirlpool river, and Tonquin valley areas, and also a small portion of the area north of the railway from Yellowhead. This not only completes a much-needed work but serves to open up new areas in the park.

New Buildings.—A number of suitable residences of the bungalow type were erected during the year, some of which are very artistic. Plans have also been filed for a number of new business buildings.

The steel bridge and approaches at the crossing of the Athabaska river were completed during the summer and afford a safe and convenient crossing.

Contagious Diseases Hospital.—A small hospital to care for contagious diseases has been provided and equipped. Should an emergency arise the hospital is now well fitted to deal with it. Accommodation for 10 patients is provided.

Agnes Laut Colony, Lake Edith.—Miss Agnes Laut, the well-known writer and publicist, and Miss Julia E. Follett, of New York, have erected four attractive log bungalows, the first of the proposed colony of authors, artists and university professors which Miss Laut hopes to establish in the park.

Telephone Construction.—Twenty-eight and a half miles of telephone lines were constructed during the year, adding greatly to the efficiency of the fire and game protection service. The longest line runs from the Athabaska Falls to Sunwapta cabin, a distance of 19½ miles.

Predatory Animals and Birds.—During the year the warden service has continued an active campaign against all forms of predatory life. In addition to numerous crows, hawks, pack-rats, etc., the following predatory animals and birds were destroyed, principally by trapping, during the past winter: 1 timber wolf, 21 coyotes, 3 wolverines, 5 weasels, 1 lynx, 1 eagle.

Forest Reproduction.—There is an unusually heavy new growth of both Douglas fir and spruce, gradually spreading over the valley of the Athabaska. This supersedes the lodgepole pine, and forms a much more valuable timber asset than the latter. This new growth is especially noted in and around Jasper where both Douglas fir and spruce are observed. From Bedson to Brule and Errington the major portion of the new growth is spruce; this also applies to the east bank of the Athabaska from Snaring Junction north to the park boundary.

APPENDIX No. 5

Report of the Superintendent of Waterton Lakes Park, G. E. Bevan, Waterton Park, Alta.

The outstanding feature of the season, 1921-22, was the marked increase in visitors. Approximately 20,000 persons visited the park, and their whole-hearted and enthusiastic appreciation will do much to advertise its attractions. Fully 70 per cent of these arrived by motor car, bringing their own camping equipment and supplies.

The remarks of widely travelled tourists in the visitors' register reveal the surprise and delight experienced by visitors. One publicist, who has visited every scenic attraction from Mexico to northern Canada, stated that Waterton Lakes was the "gem of them all." It is evident that this park is now coming into its own. With the increase of facilities for the accommodation of tourists and the extension of the road system it will become one of the most popular resorts in the whole of the West and an increasing source of benefit in money and health. It forms too, with Glacier park in Montana, an international playground which gives an additional interest and value.

As expected the opening of the new subdivision early this spring caused a revival of interest in building and many lots were applied for.

GAME PROTECTION

Moose.—Except for an occasional stray animal, no moose make this park their habitat. The few that sometimes make their appearance evidently wander in from British Columbia or Montana.

Deer.—There is no question regarding the increase of the mule or black-tailed deer, as daily evidenced by the entries in the warden's diaries, and by personal observation. On one occasion last spring 84 were counted in one herd in the immediate vicinity of headquarters. The number of yearlings in these herds is a matter of congratulation, as showing the decrease in wolves and coyotes, natural enemies of the deer.

Rocky Mountain Sheep.—The head of this animal, known commonly as the bighorn, is the most sought for trophy of the hunter. During the summer sheep seek the upper slopes, but with the coming of autumn they seek the valleys and may then be easily seen and estimated. The same flock ranged on Vimy mountain this year as last, and would appear to have increased in numbers.

Goat.—From the diaries of wardens, goat appear to be increasing in the park, though it is extremely difficult to make an estimate of their numbers, as they inhabit the upper slopes of the most rocky and precipitous mountains.

Beaver.—These are undoubtedly increasing, so much so that ranchers and homesteaders in districts near the park have been granted permits to trap them. These are no doubt the overflow of the natural increase in this sanctuary. Beavers never cease to excite interest among the visitors to this park and evening parties are often made to go and "watch the beaver."

Bear.—Bears are clearly on the increase though as a rule they are only seen in spring when they are leaving their winter quarters. In the summer they disappear to their solitary ranges and though a few cases of pilfering have been reported they have not become a nuisance.

Bird Life.—During the migratory season water-fowl are in evidence. Then, the lakes being on their direct route south, many flocks rest a day or so on their long flight, and swans, geese, and ducks are to be seen in tremendous flocks. Grouse, partridge, and kindred species appear to be increasing. The smaller feathered varieties are here in abundance and are a never ending source of interest to our campers and visitors.

Predatory Animals.—Cougars (mountain lions), wolves, and coyotes are the largest and most persistent enemies of game animals and continued efforts to reduce them are made by the wardens with good effect.

Fishing.—The satisfaction expressed by the tourists with regard to the park fishing attractions is gratifying. The largest lake trout caught this season weighed 37 pounds, while a dozen or more weighed between 20 and 30 pounds.

PROTECTION AND DEVELOPMENT

Fire Protection.—Only one forest fire of magnitude occurred here last season, notwithstanding the dry, hot summer. This was, however, a severe one. Isolated in one of the most inaccessible portions of the park, where trails had to be cut to allow the passage of men and equipment, it had attained considerable headway before it could be checked . Here again the portable fire-fighting units proved their value.

Telephones.—With the completion of the line between the Belly river ranger station and the new Lees cabin, about 60 miles of forest service line will be in operation. For the maintenance and improvement of this important service 500 poles have been cut and stacked during the past winter.

Trails.—A new trail to the summit of Vimy mountain was cleared and partly graded. Another was cut to Bertha lake and one to Cameron lake and the boundary was also partly completed.

Roads.—Two miles of the Oil City road were completed during the summer. The commencement of this road, which is destined to be the main trunk highway of the park, has caused much satisfaction to patrons of the park. The road will eventually cross the southeastern corner of British Columbia and will connect with roads leading to the Pacific coast and Banff-Windermere highway. When completed it will thus place Waterton Lakes park on the International park-to-park highway, and in addition it will open up a vast mountain hinterland of unexcelled scenic beauty.

Farming Operations.—The park farming operations produced sufficient crop to provide headquarters with grain for the winter months and forage for the year. It is hoped in the near future to harvest enough forage to supply not only headquarters but the wardens' stations as well.

Grazing.—Owing to the effect of the general financial depression on the stock industry there were fewer applications for grazing permits. Those issued aggregated only 1,763 in 1921, as against 1,912 in 1920.

Visitors.—The increasing popularity of Waterton Lakes park as a summer resort is evidenced by the large increase in the tourist traffic. The following comparative figures of the numbers visiting the park show this conclusively: 1918, 5,000; 1919, 9,000; 1920, 14,000; 1921, 20,000; total, 48,000.

Last season's entries in the park register show representatives from 32 States of the Union, from ten foreign countries and from each of the provinces of the Dominion. The completion of the main trunk highway through the park will tend to increase the number of visitors from the Pacific States.

The recreations at Waterton park during the season include fishing, boating, bathing, motor launch trips, hiking, horseback trips, golf, dancing, etc. The initial work done on the new golf course and the decision to complete the course during the coming season has been received with great enthusiasm by local patrons.

APPENDIX No. 6

REPORT OF THE SUPERINTENDENT OF BUFFALO PARK, A. G. SMITH, WAINWRIGHT, ALBERTA.

Farming Operations.—The land under crop consisted of 415 acres seeded to oats, 180 acres being summer-fallow, 100 acres fall ploughing and the remainder spring ploughing. Approximately 35 acres were cut for green feed and from the remainder 9,200 bushels of oats were threshed, this being sufficient for the park requirements for the coming year, including seed. About 3,000 bushels were shipped to other Dominion parks.

Haying.—A total of 850 tons of hay was secured this year, of which 800 tons were cut on the Ribstone meadow. All of the latter was this year's growth and well saved. The remainder, mostly upland hay, was cut in the cattalo enclosure, home paddock and at Rocky Ford. Permits covering 175 tons, in small lots, were granted to settlers living in the vicinity of the park.

Fire Protection.—With the exception of 21 miles of fireguard along the west side, which were ploughed by contract, all of the guards were ploughed by park outfits. There was one bad fire during the year. This fire entered the park from the outside at the southwest corner and burned over 1,000 acres of grazing land.

Fencing.—About 40 miles of the main fence on the north, east, and south boundaries were repaired, and 5 miles of new fences erected in Winter Quarters, in connection with the construction of receiving pastures and a "cutting-out" corral.

Telephone Line.—Nine miles of new telephone line were constructed connecting the warden's cabin on the west side of the park with the park telephone system.

Timber Permits.—Fifty-four dry wood permits, each permit being for 25 cords of wood, were issued to people living in the vicinity of the park for their own use. Permits were also issued to farmers covering 22,000 willow fence-pickets, a privilege greatly appreciated by the settlers in the district.

Wild Animals.—Nineteen yak were brought in from Banff last fall and are doing well. All the animals are looking well and are thriving. The natural increase in buffalo for the year has been 1,075, bringing the total number now in the herd up to 6,146.

The records show that there are at present the following animals in the park: buffalo, 6,146; moose, 24; elk, 187; mule deer (estimated), 466; antelope, 4; cattalo, 13; yak, 22; domestic cattle (cattalo experiment), 17; total, 6,879.

Breeding Experiments.—Very encouraging results are being obtained from the experiments in cross-breeding domestic cattle with buffalo and yak, which are being carried on by the Department of Agriculture in this park; although these experiments, as can be expected, must necessarily be very slow and it will be some years before definite results can be achieved.

Birds.—The protection afforded all bird life in a sanctuary of this kind is certainly of great benefit, and it is interesting to note how the wild geese and ducks recognize that it exists. Sportsmen of the district also appreciate the protection given to game birds and realize that the good shooting to be had outside the park during the open season is chiefly due to the fact that all bird life is safe within the boundary of the park.

Coyotes.—During the year 65 coyotes were destroyed. A few of these were shot but the majority were killed by dogs, as this has been found to be the most effective method of dealing with these predatory animals.

Visitors.—Buffalo park, during the past season, was honoured with a visit from their Excellencies the Duke and Duchess of Devonshire and party. The animals were rounded up for the occasion and the vice-regal party had the novel opportunity of viewing such a great herd of buffalo living under natural conditions.

Motor traffic to the park was greater than during any previous season, in fact most of the 7,000 visitors to our park travelled in this manner.

APPENDIX No. 7

REPORT OF THE SUPERINTENDENT OF ELK ISLAND PARK, ARCHIBALD CONDON, LAMONT, ALBERTA

In June and July the ploughing of the fireguard and widening it 16 feet on the east side of the park was carried out. Some of the sloughs were also corduroyed so as to connect the different sections of the fireguard throughout, which will make it much easier for ploughing and disking. No fires occurred in the park during the year.

As usual the main fence was thoroughly gone over and all weak places repaired. In order to protect the hay land in the forest reserve a new fence was also built around sections 10 and 11 and the north half of section 2. Haying was begun about the first of August. The crop was approximately 400 tons and this, with the 50 tons carried over from the previous year, was sufficient for the winter's feed.

The main road into the park and through the buffalo pasture was gone over and put into good condition. Later a trail was cut from the Sandy Beach fireguard to the east fence for convenience in case of fire.

Animals and Birds.—All the wild animals in the park are in splendid condition. There was a net increase of 37 buffalo. The total number of animals now in the park is as follows: buffalo, 270; moose, 70; elk, (estimated) 200; mule deer, (estimated) 150. It is believed that the coyotes do considerable damage to the small deer. There is so much brush here and they are so cunning it is difficult to make much headway against them, although by shooting, trapping, and baiting six were killed during the winter.

Wild birds of all kinds are very plentiful. Partridges, prairie chickens, and herons nest in the park and when the shooting season opens the wild ducks flock in hundreds into the park for the protection it affords and they remain until the lake freezes.

Visitors.—It proved a very busy season with visitors and campers, the total number coming through the gate being 5,443. Two parties took out permits to build cottages and it is hoped that before spring opens a survey will be made of a number of lots for building purposes.

APPENDIX No. 8

Report of the Superintendent of Point Pelee Park, F. H. Conover, Leamington, Ont.

The past season showed an increased number of visitors at Point Pelee park both from Canada and the United States. The fact that the park is only thirty-eight miles from Detroit, a city of one million people, together with its southerly situation and unusual attractions, no doubt accounts for the large number of motorists who come here from across the border. Each year finds it increasing in favour as a pleasure resort.

The new and handsome pavilion has been much commented upon. It is centrally located in the park facing lake Erie and in close proximity to an excellent bathing beach. Ample accommodation for bathers will soon be provided in the new bath-house which will be constructed this season.

The absence of mild easterly winds, which usually bring in a supply of sand and gravel, brought about a deficiency in road materials so that the surfacing of only half the road could be undertaken. Under favourable conditions the remainder can be completed early in the coming season.

Three supply wells for fire units were sunk at points that would be most accessible in the event of fire. Covers for these are now being made as well as benches and tables for the park and pavilion.

The wild life of the marshes is showing the benefits of increased protection and is rapidly increasing in numbers. The quail (Bob White) have passed the winter safely and are now evidently becoming established for they are fairly plentiful within the park, as are also the ringneck pheasants. Muskrats, too, are abundant.

The migratory songsters, including robins by the hundreds and bluebirds in limited numbers, appeared about February 20 joining a large colony of jays that wintered within the park.

APPENDIX No. 9

REPORT OF THE HONORARY SUPERINTENDENT OF FORT ANNE PARK
L. M. FORTIER, ANNAPOLIS ROYAL, N.S.

Fort Anne, redolent of history and romance and a beauty spot as well, is attracting a larger number of visitors each year. Fully eight thousand persons visited the fort in the year just closed, of whom 4,775 registered.

There have been many additions to the museum and we have now four rooms and two corridors in the old "Officers' Quarters" filled with objects of interest, and the task of showing and explaining them to visitors is no light one.

The most noteworthy event of the past year was the historical celebration on the 31st of August, when tablets were unveiled in the fort commemorating (1) the 300th anniversary of the Charter of Nova Scotia, (2) the 200th anniversary of the sitting (in this fort) of the first court administering English Common Law in what is now the Dominion of Canada, and (3) the 100th anniversary of Haliburton's arrival in Annapolis Royal. These three splendid memorials are now placed, one outside and the other two inside the Administration building in Fort Anne. A volume is about to be published by the Historical Association of Annapolis Royal giving an account of the ceremonies connected with the erection of the tablets and verbatim reports of the speeches made and papers read on that occasion.

APPENDIX No. 10

REPORT OF THE ST. LAWRENCE ISLAND PARKS

The island reservations in the St. Lawrence river attract each year an increasing stream of visitors. On some of the larger islands near Brockville and Morrisburg picnickers sometimes number as many as a thousand a day, and each island has its quota of permanent campers throughout the season. It is estimated that approximately 30,000 people make use of the parks during the summer, which is good evidence of their public value.

The new Broder park, which is one of the largest and finest of the islands, has become a very popular resort and there is never a day throughout the season when its bathing beach and recreation grounds are not occupied by happy picnickers. A comfortable pavilion was erected last year. In the other parks the work consisted of the usual repairs to wharves, painting, and clearing.

PART III

FORESTRY

REPORT OF THE DIRECTOR OF FORESTRY, R. H. CAMPBELL.

This report covers the work of the Forestry Branch for the fiscal year 1921-22, ended March 31, 1922.

Although the prevailing commercial depression throughout Canada, in common with the rest of the world, was reflected in many of the lines of activity of the Forestry Branch, the total effect was not so great as might have been anticipated, and some features of the work show a gratifying expansion, which indicates that the trend is now toward normal conditions. It is, perhaps, notable that while several kinds of forest products taken from the forest reserves show decreases there were increases in fuel-wood, building logs, and railway ties. There was an increase of about $2,500 in the revenue received, the total for the fiscal year being $146,266. Losses from forest fires were lighter than in the preceding year, chiefly owing to climatic conditions, but owing also, in part, to increased efficiency on the part of the fire-fighting organization and to additional equipment and improvements. Increased interest was manifest in tree-planting on prairie farms; and the work of forest research, both as regards forest reserves and utilization of forest products, shows steady progress.

FIRE PREVENTION AND SUPPRESSION

Viewing the area covered by the Forestry Branch as a whole, the season of 1921 was a favourable one from the standpoint of forest protection. The fire-hazard was very light in Manitoba and Saskatchewan and much greater in Alberta and British Columbia. In the two former provinces, as there was plenty of precipitation at the right time, only a few fires started, and these were easily controlled. In Alberta there were two periods of unusual fire-danger. In the southern part of the province there was plenty of rain in the spring and there were few fires, but in the autumn there was a period of dry, hot weather when fires were numerous. In the northern districts the weather was dry in early spring, resulting in many fires. The result was a total of over 842 fires, but only 35 of these developed to such an extent as to cover more than ten acres each. In British Columbia the season was one of abnormal fire-danger, but the danger area was restricted to the Salmon Arm fire ranging district and the reserves surrounding. In the Coast and Revelstoke districts there was good precipitation and few fires broke out. Though in the Salmon Arm district this was one of the worst fire seasons ever experienced, and though the total number of fires increased from 408 in 1920, to 455 in 1921, the proportion of large fires (that is, fires over ten acres in extent) was reduced as well as the total area burned and the total amount of timber damaged, as compared with the preceding year. The number of fires in the Railway Belt caused by railways increased from 90 to 214, due largely to the reversion to the use of coal as locomotive fuel in place of oil. At the same time, the acreage burned over by railway fires decreased. This was largely due to the improved patrol work on the part of the railways.

The year's record shows increased efficiency in the detection and suppression of fires. This was due not only to improved organization of the fire-ranging force but also to improved equipment, the use of portable gasolene fire-pumps, motor transport and gasolene speeders, the establishment of lookout stations, and also the use of aeroplanes. Increased efficiency also came about from changes in the Fire Prevention Acts of Manitoba and Alberta, which gave Dominion forest officers greater powers in dealing with matters which come under provincial jurisdiction. In some of the provinces many fires were caused by the burning of brush contrary to the law, and probably more persons were convicted for this offence than in any previous year. The necessity for such action is regretted but the authorities in all the provinces are becoming seized of the importance of enforcing the laws which protect this great natural resource. The total number of fires for the season was 1,434, as compared with 1,532 for the preceding season. Of these 1,211 fell into the class of small fires, that is fires burning less than ten acres each, and 223 were large fires, burning areas of ten acres and over. Thus 16 per cent were large fires, a reduction from the figures of the previous year, when 27 per cent of the fires fell into the large class. The total area burned over was 121,788 acres, of which 23,853 acres bore merchantable timber; 19,356 acres, young growth; while the remainder was open or grass land. These totals represent a reduction from the previous year when the figures were: total area burned over, 485,500 acres; merchantable timber, 110,000 acres; young growth, 152,600 acres.

FIRES WITHIN FOREST RESERVES

Cause	1921		1920		1919	
	No.	%	No.	%	No.	%
Unknown	32	11	43	20	79	36
Campers and travellers	28	9	28	13	30	14
Settlers	10	3	11	5	26	12
Railways	193	65	94	44	46	21
Lightning	9	3	27	12	9	4
Lumbering			2	1	12	5
Incendiary	23	8	2	1	6	3
Brush disposal other than by settlers	1	*	2	1	5	2
Other known causes	4	1	7	3	7	3
Total	300	100	216	100	220	100

*Less than 1 per cent.

FIRES OUTSIDE FOREST RESERVES

Cause	1921		1920		1919	
	No.	%	No.	%	No.	%
Unknown	174	15	200	15	262	24
Campers and travellers	108	10	187	14	122	11
Settlers	329	29	106	8	212	20
Railways	370	33	596	46	372	34
Lightning	38	3	138	11	48	4
Lumbering	12	1	24	2	15	1
Incendiary	20	2	16	1	16	1
Brush disposal other than by settlers	37	3	16	1	18	2
Other known causes	46	4	33	2	28	3
Total	1,134	100	1,316	100	1,093	100

TOTAL OF ALL FIRES ON DOMINION LANDS

Cause	1921		1920		1919	
	No.	%	No.	%	No.	%
Unknown	206	14	243	16	341	26
Campers and travellers	136	10	215	14	152	11
Settlers	339	24	117	8	238	18
Railways	563	39	690	45	418	32
Lightning	47	3	165	10	57	4
Lumbering	12	1	26	2	27	2
Incendiary	43	3	18	1	22	2
Brush disposal other than by settlers	38	3	18	1	23	2
Other known causes	50	3	40	3	35	3
Total	1,434	100	1,532	100	1,313	100

THE USE OF AEROPLANES IN FOREST PROTECTION

The season of 1921 was the second in which, by co-operation between the Air Board of Canada and the Forestry Branch, aeroplanes were used in the work of protecting the national forests in Manitoba, Alberta, and British Columbia. In each of these the work varied with the nature of the ground to be covered. In the forested area of Manitoba, where there are many lakes and rivers to form good landing-places, the most successful results were attained by the use of large planes capable of carrying eight or ten persons. When small fires were discovered, the airman and his helper landed and put them out. When the fire was a large one, the machine was flown to some trading-post or village and fire-fighters were carried quickly to the fire, along with the necessary tools and provisions. In Alberta, machines were used equipped with wireless telegraph apparatus. From the planes the news of the discovery of a fire was sent by wireless to the aeroplane headquarters whence it was telephoned to the ranger station nearest the fire. In this way fire-fighting crews were sent out within a few minutes after the discovery of a fire, with the result that very few fires attained large proportions. In British Columbia it was found possible to fly directly over the fires at low elevation and thus gain all necessary knowledge as to their size, direction, and the points from which they could be best controlled. Planes were particularly efficient on days when the smoke haze rendered it impossible to locate the fire exactly from the lookout stations.

In all the provinces in which the aeroplanes were used the moral effect of these patrols was most salutary. Campers, settlers burning bush, and holiday excursionists from the cities were all made more careful in handling fire by the passing of the aeroplane overhead. Cards printed with suitable messages were carried by the airmen and dropped over camps and picnic parties, etc., and in certain cases special trips were made to drop these messages over fairs and sports meetings.

IMPROVEMENTS

The successful conditions for combating the fire-danger in forest areas are: first, means of getting news of the fires quickly to headquarters, and second, avenues of communication by means of which men may be quickly transported to the fires in order to extinguish them. This means the construction of a number of permanent improvements on the reserves, and the more complete these are the better will be the fire protection afforded. Improvements on Dominion forest reserves are planned for a long time ahead. In the slack seasons when there are no fires, the protective forces are employed in erecting telephone lines, lookout stations, and in constructing

roads, trails, bridges, etc. In years when the number of fires is large, little work can be done on improvements, but when the number of fires is small the number of miles of telephone lines, roads, etc., is correspondingly increased. Except in British Columbia, where in one district there was a very heavy season of fire-fighting, the season on the whole was favourable, so that there was a good showing in regard to improvement work. The construction of improvements was rendered easier by the fact that the cost of materials was lower and that labour was easier to obtain. In all, the sum of $55,811 was expended on improvements and this, as explained above, was supplemented by the labour of rangers when not fighting fires. In addition to improvements on the reserves the rangers employed in the fire ranging districts outside of reserves also improved the trails, portages, camp-sites, etc. This not only facilitates their own movements but also gains the co-operation of those who travel in the northern woods, which makes for greater protection. In addition to the construction of improvements given in the table below, all existing improvements were maintained in good condition. Some work was uncompleted at the end of the year and is not included. The figures are:—

	Number		Miles
Cabins	18	Roads	49
Ranger station houses	6	Trails	239
Stables	14	Telephone lines	223
Lookout towers	10	Fireguards (cleared)	17
		Fireguards (ploughed)	260

SILVICULTURE

The comprehensive term "Silviculture" is used because it denotes better than any other the object kept in view in Forestry Branch timber operations on the reserves. That object is to provide the surrounding districts with as much building material and fuel as possible at the present time, while, at the same time, building up the reserve to its highest state of production for the future. Generally speaking, the object of silvicultural operations is to dispose of the old and inferior trees in order to give room for the young trees of the best kinds to grow as rapidly as possible. There are on some reserves considerable areas of timber killed by fire, insects, or disease. The aim is to dispose of this dead timber as quickly as possible, both to allow the new growth to come up, and to prevent the progress of those insects which multiply in dead timber and thus endanger the growing stand. Where the area of mature timber to be disposed of is considerable, this is done by means of competitive sales, the purchaser being required to cut all trees marked by the forest officer, and to ensure the safety of the forest by the proper disposal of the brush left after the cutting. Where the quantities to be disposed of are small, this is done by means of permits at reasonable rates, granted to the settlers in the districts surrounding the reserves. The settlers usually cut the trees themselves, and in the case of building timber, it is generally sawn in small portable saw-mills specially licensed for that purpose. This is one side of silviculture; the other is the planting and sowing the seeds of desirable species in blank areas on the reserves in order to bring on the new crop as quickly as possible.

Owing to the depression in trade and industry there was a decrease in the amount of most of the kinds of timber taken from the reserves, both under sales and permits. The exceptions were fuel-wood, building logs, and railway ties.

On all the reserves a total of 23 acres was planted with about 70,000 transplants and seedlings of white spruce, jack pine, lodgepole pine and Scotch pine. Seeding operations covered 28 acres, and included the same kinds of trees with the exception of lodgepole pine. For the most part these sowings and plantations did well; in one instance, only, was there a heavy loss, due to excessively hot weather following the

planting period. Nurseries have been started on several of the reserves in order to have a supply of planting material available locally, and additional supplies are also brought from Indian Head and Saskatoon nurseries.

An important part of the silvicultural work was the collection of tree-seed. This was mainly undertaken at the request of the British Forestry Commission, which pays the cost of the collection of the seed and its preparation for shipment. The large amount of seed handled rendered necessary the erection of a modern seed-extracting plant at New Westminster, B.C. This was efficiently operated during the seed-collecting season, and the following quantities of seed were collected: Sitka spruce, 8,125 pounds; Douglas fir, 4,500 pounds; western hemlock, 440 pounds; and smaller quantities of other species. A total of 7,500 pounds was shipped to the British Forestry Commission, and the surplus at the close of the fiscal year was being disposed of to the forestry authorities in Canada, on this continent, and in different parts of the world. The plant at New Westminster, while probably not the largest of the kind, is one of the most fully equipped and efficient.

GRAZING ON FOREST RESERVES

Though there was a slight decrease in the number of permits issued for grazing on forest reserves and in the total number of stock grazed, this does not indicate any decline in the appreciation by farmers and stockmen of this use of forest reserves. It reflects the general depression in the stock-raising industry, due to the low prices which have prevailed in the past two years. With the return of higher prices and general prosperity in the industry there is no doubt that the grazing facilities of the reserves will be used to an increasing extent. While in some of the provinces the rainfall was rather light towards the end of the season, the pasturage continued good and the stock left the reserves in good condition. In all the reserves where there are grazing areas, great care is taken to divide the privileges fairly and equitably among the farmers and stockmen of the district served by the reserve. This work has been greatly assisted by the plan of forming local stock associations which co-operate with the forest officers in the management of the herds on the reserves. Grazing surveys were continued and it is expected that all the pastures on the different reserves will be eventually covered in this way. The object of these surveys is to ascertain the extent and quality of the pasturage, to fix the maximum number of stock which may be grazed on each area without danger of injuring the grass by overgrazing, and to decide whether it is advisable to undertake any betterments looking to the improvement of the quantity and quality of the pasturage. In the Prairie Provinces the bulk of the grazing is still done on the southern reserves and there are large areas suitable for grazing in the northern districts which will undoubtedly be made use of to a much larger extent, as soon as conditions and means of transportation improve. The total number of live stock grazed was 88,392, a decrease of about 2,000 head from the preceding year. This number was made up of 58,938 cattle, 18,502 horses, and 10,952 sheep.

RECREATIONAL USES OF FOREST RESERVES

Legitimate use of the forest reserves for recreational purposes is not injurious to the reserves but rather is an advantage, but the hunter or camper must be careful not to injure the forest, and in particular should not permit any damage to result from his careless use of fire. The advantage is that this practice enables many citizens to see the forests, and thus leads them to appreciate their importance and to co-operate with the authorities in conservation work. The use by citizens of all the western provinces of the forest reserves for recreational purposes is steadily increasing. This was particularly so during the fiscal year in Manitoba and British

Columbia. A number of additional summer cottages were erected on the parts of the reserves designated for that purpose, and the number of visitors to resorts in the British Columbia reserves exceeded that in any previous year, and included, in addition to residents of the different provinces of Canada, visitors from the United Kingdom, the United States, South America, and Hawaii. In addition to the direct benefits brought by the visits there is the increasing spread of the knowledge of Canada's forest resources throughout the world.

TREE PLANTING ON PRAIRIE FARMS

Although in the fiscal year 1921-22 there was more interest shown in regard to tree planting, general conditions and unsettled markets made it impossible for many farmers who were anxious to do so to undertake any tree-planting work. Tree plantations, both as a means of preventing the bad effects of high winds on soil and crops, and also as improving the appearance and comfort of the farm home, are more highly valued than ever before, and when conditions become normal it is expected that tree planting on the prairie will receive a great impetus. At conventions and similar gatherings the value of tree planting in the West has been repeatedly and warmly commended.

From the standpoint of tree-growth, the season was a favourable one. No serious damage occurred from winter-killing in the winter of 1920-21. Not only did the different kinds of broad-leaved trees of which the belts are mainly composed come through the winter in splendid shape, but the same remark applies to the conifers (evergreens) sent out. In addition to this the reports indicate that fruit trees such as plums, standard apples, crabapples, etc., planted under the protection of the shelter-belts also wintered exceedingly well. In the Indian Head Forest Nursery Station heavy crops of plums and of eight varieties of standard apples were harvested, and the inspectors reported many instances where individual farmers had had good success with fruit trees. The Dominion forest nursery stations do not send out any fruit or ornamental trees, but farmers find that once they have a shelter belt they can grow fruit trees that would not otherwise thrive.

All classes of stock made good growth on nurseries, but it was not a good year for the collection of tree-seed. However, sufficient was secured for the requirements of the nurseries and there was some for distribution. The permanent plantations made very good growth, appreciably more than in the season of 1920. There was considerable distribution of coniferous seedlings for planting on such of the forest reserves as have no local nurseries. The weather during the shipping season was favourable, and the distribution of the planting stock was expeditiously accomplished. The number of seedlings and cuttings distributed increased by over 750,000 as compared with the preceding year, and the number of new applications for stock was over 400 more than in 1921.

FOREST PRODUCTS LABORATORIES

The fiscal year 1921-22 was a very successful one. The number of requests for information increased greatly over any previous year. The experimental paper-mill was in operation longer, the research and investigative work was greater than in any year since the opening of the war, and there were more than 200 visitors more than in any previous year.

A large number of investigations were under way, only a few of the major ones of which can be mentioned. These include the chemical composition of Canadian pulpwoods, the pulping qualities of fire-killed wood, water storage of pulp, use of hemp waste in papermaking, maximum strength of kraft paper. In the division of

Timber Physics among the investigations undertaken were the decay of timber in buildings, bending of woods, kiln-drying, and wood identifications. Over 12,000 tests were made in the progress of the study of the properties of Canadian woods. The investigation of Nova Scotia mine-timber was completed, and other investigations in progress related to the strength of aeroplane timbers, the strength of joists, nail-holding characteristics of woods, and tests of fibre-board. The chief study under Wood-Preservation was that in regard to the preservative treatment of railway-ties, which subject is receiving a great amount of attention. Other investigations were the adaptability of maple and aspen ties to preservative treatment, tests of proprietary preservatives, treatment of telephone pole brackets, and the study of fire-retardant treatment for wood. Good progress was made in all these investigations and all the other lines of work at the laboratories were carried on more actively than ever before. It is evident that the people of Canada, who have to do with forest products, are turning more and more to the laboratories for information connected with their work.

FOREST RESEARCH WORK

There are two general lines of forest investigative work which present themselves to forest authorities in Canada: first, investigation of forest resources, and second, investigation of methods of handling forest areas to secure the highest continuous production that is economically possible.

During the fiscal year 1921-22 the work on the first of these problems has been to a certain extent that of combining two lines previously carried on, namely, that of the Commission of Conservation and of the Forestry Branch. The Forestry Branch has completed a large number of surveys of forest resources of Dominion forest reserves and the work of getting this data for all the reserves is now in progress. It has also made preliminary surveys of large areas lying north of the settled parts of the Prairie Provinces. The Commission of Conservation had published completed reports on the forest resources of Nova Scotia and British Columbia and had commenced a survey of the forests of Ontario, which is being completed by the Forestry Branch.

In co-operation with the Air Board of Canada a beginning was made in 1921-22 in the investigation of the use of aeroplanes in extensive reconnaissance of forest resources, by mapping from the air and by air photography. This work was only begun in the fiscal year and is to be continued. Sufficient information was gained, however, to show the possibilities and to indicate the lines on which the best results are likely to be obtained.

The second problem, namely, that of the investigation of methods of handling forest areas to secure the highest continuous production possible, covers a very wide field and involves the study of methods of perpetuating forests of merchantable species, of replacing non-merchantable species by more valuable ones, of finding uses for trees at present unmerchantable, and study of the silvical and economic aspects of methods of natural and artificial reproduction. This last problem involves measurement and study of the yield we may expect from the different species. Work on yield requires a simple and accurate method of measuring standing timber and the development of some such method for commercial purposes, to take the place of the present system of preparing local tables for each species and locality, will be of very great value.

This widespread investigative work is directed from Ottawa and carried on at a number of points in Canada. There are, first, the forest experiment stations at Petawawa, Ont., in the Ottawa valley, and at Lake Edward, Que., in the St. Maurice valley, the latter in co-operation with the Laurentide Company and the Entomological Branch of the Department of Agriculture.

Experimental cuttings are being carried on in different parts of Canada, notably in co-operation with the Bathurst Lumber Company, of Bathurst, New Brunswick. Forest investigative work has been completed, or is being carried on, in different parts of the east, in co-operation with the provincial forest services and with the following private concerns:—

Ontario.—Spanish River Pulp and Paper Company, Algoma district; Abitibi Pulp and Paper Company, Abitibi district; Graves, Bigwood and Company, Sudbury district; McLachlin Brothers, Hawkesbury Lumber Company, and Gillies Brothers in Nipissing district; the Shroeder Mills and Timber Company, Parry Sound district.

Quebec.—Laurentide Company in the St. Maurice valley, and Riordon Company in the Rouge valley.

New Brunswick.—Bathurst Lumber Company, Gloucester county, and the J. B. Snowball Company, Northumberland county.

Arrangements have been made for the coming season to co-operate with the following concerns:—

Ontario.—J. B. Smith and Sons, Nipissing district; Eastern Lands Canadian National Railways, Poupore Lumber Company, and Hayward Lumber Company, Algoma district; Shevlin-Clarke Company, Fort Frances; Dryden Pulp and Paper Company, Dryden.

Quebec.—Price Brothers, Limited, Chicoutimi; Howard Smith Pulp and Paper Company, Gaspe.

New Brunswick.—Pejepscot Pulp and Paper Company, Kingston, Northumberland county.

The whole-hearted co-operation of the provincial forest services and of the various companies is appreciated.

The same lines of investigation are carried on by the staff on the Dominion forest reserves in Manitoba, Saskatchewan, Alberta, and British Columbia, and by the Dominion Forest Nursery Station at Indian Head, Sask.

A proportion of the work involves repeated measurements over a period of years, so that none of the main problems has yet been completed. Some of the individual studies have been finished for certain species, conditions and localities, but the general application of the conclusions drawn from these studies must be verified by further investigations in other species and localities.

The work on methods of estimating timber for commercial purposes is further toward completion. A number of volume tables have been prepared and are available to those requiring them.

Extensive work has been done on the conditions of growth that follow cutting operations and practical conclusions have been reached, for some localities, as to the proper method to adopt for handling pulpwood species. Promising experiments have been made in increasing the proportion of softwood in the mixed hardwood-softwood forest. Experiments in natural and artificial reproduction are under way and have met with a due measure of success. Measurements and study of yield of the important Canadian species in the natural and thinned forest are in progress, this work being carried on simultaneously with the work on methods of estimating.

Brush disposal is an established and successful practice on the Dominion forest reserves in the West and valuable information has been secured in regard to the practical possibility of applying silvicultural methods to timber sales.

The work of developing uses for species at present unmerchantable is carried on by the Forest Products Laboratories, the report of which division forms part of this report.

PUBLICATIONS AND PUBLICITY

The publication and publicity work showed considerable expansion during the fiscal year. In addition to the annual report the chief documents in pamphlet or report form were: the ninth printing of Bulletin No. 1, "Tree-planting on the Prairies," which brings this to a total of 70,000 copies issued; Bulletin No. 71, "Canadian Sitka Spruce—Its Mechanical and Physical Properties," which is another in the series dealing with Canadian commercial woods; and Circular No. 13, "The Cascara Tree in British Columbia." A good deal of material in smaller form was issued and material for newspapers was prepared and distributed in greater quantity than ever before. Fire-warning posters and cards bearing concise notices for distributing to incoming tourists and for dropping from aeroplanes were increased in numbers and attractiveness. Warnings against careless use of fire in the forests were again placed on the cancelling stamps of a number of western post offices, through the co-operation of the Post Office Department.

THE LIBRARY

As the research work of the branch increases, the demand upon the library's resources correspondingly increases, and the tendency is for the library to assume a position of increasing importance in the work of the service. By securing loans from other offices—not only in Ottawa, but also in Toronto, Washington, New Haven, and other centres both in Canada and the United States—the work of the research staff has been facilitated and extended. The project, initiated last year, of preparing and circulating lists of references on certain selected subjects has been continued. Up to the present the lists have dealt with the tables of growth, volume, etc., in the library at this office; of these, seven have been sent out during the year. They have been sent, not only to officers of the branch, but also to a selected list of others to whom the lists are of interest and use, a number of whom have expressed their appreciation.

During the year there were added to the library some 500 books and pamphlets, and a total of 111 periodicals were regularly received—41 by subscription and 70 through exchange. Some 950 photographs have been added to the collection, making the total number of pictures now about 13,250.

STATISTICS

The collection of statistics relating to the annual production of sawn lumber, lath and shingles, pulpwood, wood-pulp, and paper in co-operation with the Dominion Bureau of Statistics was carried on as in previous years. Bulletins for the calendar year 1919 were issued for publication together with press letters and preliminary reports covering the calendar year 1920. The schedules containing the reports on which these publications were based were revised in the Forestry Branch, and the final reports were checked and edited before publication. Investigations of the wood-using industries of Canada were resumed.

STAFF

The total permanent staff of the Forestry Branch for the last year was as follows:—

Head office	54
District inspectors	5
Assistant district inspectors	2
Forest supervisors	19
Foresters and forestry assistants	23
Forest rangers	93
Chief fire rangers	11
Promoters of tree planting	8
Forest Products Laboratories, technical staff	16
Outside clerical staff	50
	281

APPROPRIATIONS

The appropriation for the fiscal year was $1,000,000 plus refunds from fire-guarding, etc., $23,579.99. Total available for expenditure $1,023,579.99. The expenditure was divided as follows:—

Salaries at head office	$ 18,754 90
Travelling expenses	2,497 37
Printing and stationery	18,978 27
Miscellaneous expenses	13,674 16
Statistics	4,067 50
Fire-ranging	258,630 95
Forest reserves	492,794 75
Surveys and research	45,189 44
Tree planting	71,548 35
Forest Products Laboratories	36,199 88
Total	$1,012,335 57

The field expenditures in the western provinces, exclusive of tree planting on prairie farms, were divided as follows:—

Manitoba	$ 128,302 07
Saskatchewan	203,828 86
Alberta	250,137 53
British Columbia (Railway Belt)	185,186 91
	$ 767,455 37

TABLE I—STATEMENT OF REVENUE, FORESTRY BRANCH, FISCAL YEAR ENDED MARCH 31, 1922

Reserve	Timber sales	Timber fees and dues	Timber seizures	Grazing permit and trespass dues	Hay permits and seizures	Surface rentals	Special uses	Nursery stock	Unclassified	Total
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Turtle Mountain		194 14	10 00	3,652 65	553 00	71 60	32 00			4,513 39
Spruce Woods		84 75		1,186 55	147 75					1,419 05
Riding Mountain		5,451 43	512 34	997 50	931 10	213 20	529 00			8,604 57
Duck Mountain		2,289 74	187 80	489 25	442 50	277 80	17 00			3,704 09
Moose Mountain		398 20	12 00	1,001 45	132 75	103 00	608 42			2,255 82
Beaver Hills		108 00	15 00	425 96	373 50	22 00				944 46
Porcupine	2,206 31	695 59	292 30	424 05	532 75		78 00			4,229 00
Pasquia	12,758 06	2,911 66		21 27	304 00		56 00			16,050 99
Fort à la Corne	247 34	624 50	12 00	2 65	12 00					898 49
Pines	50 00	1,605 25	58 91	658 02	72 75		31 00			2,475 93
Nisbet	160 50	3,740 97	171 10	203 86	86 25		58 00			4,420 68
Big River		227 02		205 78	405 50		30 00			868 30
Steep Creek		23 75								23 75
Sturgeon		379 05		282 14	108 50		5 45			775 14
Keppel		236 25		833 70			10 00			1,079 95
Manito		286 20		2,120 89	48 50		32 00			2,487 59
Dundurn		10 25		674 15	80 00		10 00			774 40
Seward				734 07	63 75		26 00			823 82
Elbow		33 60		852 70	726 00		100 00			1,712 30
Big Stick				6,369 76			61 00			6,430 76
Cypress Hills		1,557 11	53 90	5,292 12		30 05	11 00		138 45	7,082 63
Cooking Lake		27 00		998 79	235 25					1,261 04
Crowsnest	1,814 85	2,316 81	650 55	8,411 35	21 50	28 20	255 13		30 00	13,561 39
Bow River		2,918 43		6,596 21	31 00		69 15			9,614 79
Clearwater	16,063 98	253 20		179 86	31 75	23 00	221 60			16 773 39
Brazeau	8,244 66	1,934 50		45 30		560 14	340 00			11,124 60
Athabaska	1,633 00	17 32		58 31	11 25		81 00			1,800 88
Lesser Slave	10,991 66			23 78	88 79		21 00			11,125 23
British Columbia Reserves	6,667 55	133 45		12 25	77 75	337 90	198 32			7,427 22
Indian Head Nursery							3 00	1,528 50	471 15	2,002 65
Total	60,867 91	28,458 17	1,975 90	42,724 37	5,520 89	1,666 89	2,884 07	1,528 50	639 60	146,266 30

TABLE 2 STATEMENT OF TIMBER PERMITS ISSUED IN FOREST RESERVES, FISCAL YEAR ENDED MARCH 31, 1922

Reserve	No. of permits		Kinds and Quantities of Timber Authorized to be Cut								Dues and fees
	Free	Paid	Poles or rails	Fence-posts	Saw-timber	Railway cross-ties	Mine timber	Building logs	Fuel green	Fuel dry	
					Ft.B.M.		Lin. Ft.	Lin. Ft.	Cords	Cords	$ cts.
Turtle Mountain	109	22		600	7,366			7,670		2,791	194 14
Spruce Woods	64	10	80	400				1,000		1,035	84 75
Riding Mountain	196	565	1,716	22,228	1,424,868			15,436	544	5,847	5,451 43
Duck Mountain	192	157	3,345	14,130	606,336			17,461	4	4,773	2,289 74
Moose Mountain		119		6,175				2,960	7	752	398 20
Beaver Hills	66	4		600				5,400		653	108 00
Porcupine	25	31	600	5,104	189,196			23,350		123	695 59
Pasquia	22	93	400	43,034	756,772			8,594	20	7,464	2,911 66
Fort à la Corne	67	87	850	8,185	117,823			10,324	25	1,803	624 50
Pines	60	109	3,150	3,093	21,350	3,000		9,200		5,320	1,605 25
Nisbet	175	220	2,225	6,450	15,668	3,036		19,060	100	13,843	3,740 97
Big River	19	14	2,900	6,050				13,240		649	227 02
Steep Creek	2	3		400	2,500					35	23 75
Sturgeon	1	7		690	20,000	6,648		2,080		25	379 05
Keppel	36	44		360				250	56	302	236 25
Manito	36	86	7,800	5,750				1,000	205	472	286 20
Dundurn	5	2							16	40	10 25
Elbow	21	4			1,000			80		208	33 60
Cypress Hills	125	417	20,445	52,575	74,930		2,000	48,178	1,022	2,500	1,557 11
Cooking Lake	23	2		250						476	27 00
Crowsnest	201	109	10,995	8,155	558,682		30,000	137,447	10	1,036	2,316 81
Bow River	32	54	10,107	9,380	15,160		1,050	288,468		797	2,918 43
Clearwater	58	14						12,670		1,837	253 20
Brazeau	18	14			30,000		285,864	194,666		505	1,934 50
Athabaska	3	1						2,664		50	17 32
British Columbia Reserves	6	18	2,400	200	33,000		27,375	4,458	21	63	133 45
Total	1,562	2,206	66,413	193,719	3,874,651	12,684	346,289	825,656	2,020	53,399	28,458 17

TABLE 3—STATEMENT OF GRAZING PERMITS ISSUED IN FOREST RESERVES, FISCAL YEAR ENDED MARCH 31, 1922

Reserve	No. of permits	Number of Stock				Dues and fees collected
		Cattle	Horses	Sheep	Total	
						$ cts.
Turtle Mountain	137	1,596	226		1,822	3,644 40
Spruce Woods	56	1,257	171		1,428	1,186 55
Riding Mountain	97	1,623	78	40	1,741	879 50
Duck Mountain	26	1,261	23		1,284	489 25
Moose Mountain	94	2,071	281		2,352	1,001 45
Beaver Hills	37	899	57		956	425 96
Porcupine	41	994	77		1,071	414 05
Pasquia	6	52	8		60	21 27
Fort à la Corne	1	5	2		7	2 65
Pines	32	1,457	118		1,575	658 02
Nisbet	21	470	15		485	203 86
Big River	6	497	32	40	569	205 78
Sturgeon	14	569	42		611	282 14
Keppel	45	1,293	418	700	2,411	833 70
Manito	87	3,264	783	19	4,066	2,100 69
Dundurn	30	1,468	317		1,785	674 15
Seward	18	387	319		706	734 07
Elbow	85	1,290	562	550	2,402	852 70
Big Stick	103	8,625	2,797	6,650	18,072	6,342 76
Cypress Hills	97	6,119	3,881		10,000	5,227 32
Cooking Lake	69	1,979	74		2,053	998 79
Crowsnest	143	12,295	3,739	2,953	18,987	8,411 35
Bow River	179	9,367	4,143		13,510	6,566 61
Clearwater	43	37	214		251	179 86
Brazeau	3		49		49	45 30
Athabaska	8	6	55		61	58 31
Lesser Slave	2	14	15		29	23 78
British Columbia Reserves	6	43	6		49	12 25
Total	1,486	58,938	18,502	10,952	88,392	42,476 52

TABLE 4—STATEMENT OF TIMBER CUT ON FOREST RESERVES UNDER AUTHORITY OF TIMBER SALES, FISCAL YEAR ENDED MARCH 31, 1922

Reserve	Previous sales still operating	Sales made current year	Sawtimber	Mine Timber		Telephone poles	Railway cross-ties	Poles	Dues collected
				Props	Lagging				
			Ft. B.M.	Lin. ft.	Cords	No.	No.	Lin. ft.	$ cts.
Porcupine	5		1,031,057	158,188	100,357				2,206 31
Pasquia	7	3	4,209,174						12,758 06
Fort a la Corne	2		291,077						247 34
Pines		1							50 00
Nisbet	1				591				160 50
Crowsnest	1		38,705						1,844 85
Clearwater	2	2		85,887	105,090				16,063 98
Brazeau	4	1	1,218,173	666,858	706,208		571,405		8,244 66
Athabaska	1		405,834						1,633 00
Lesser Slave	3		2,279,846						10,991 66
British Columbia Reserves	8	1	301,074			9,950		73,315	6,667 55
Total	34	8	9,774,940	910,933	912,246	9,950	571,405	73,315	60,867 91

TABLE 5—STATEMENT SHOWING QUANTITY OF TIMBER SOLD AND REVENUE DUE, FISCAL YEAR ENDED MARCH 31, 1922, ON LICENSED TIMBER BERTHS WITHIN DOMINION FOREST RESERVES.

MANITOBA

Reserve	Timber berths	Area in reserve	Quantity sold			Revenue		
			Lumber	Lath	Other* products	Dues payable	Rent payable	Total payable
	No.	Sq. Mls.	Ft.B.M.	No.		$ cts.	$ cts.	$ cts.
Riding Mountain..	4	42·43	398,651	.	3,867	223 98	222 15	446 13
Duck Mountain...	11	99·76	163,846	.	....	122 85	499 90	622 75
Total.....	**15**	**142·19**	**562,497**	.....	.....	**346 83**	**722 05**	**1,068 88**

SASKATCHEWAN

Porcupine and Pasquia	40	868·37	42,090,091	8,904,321	1,535,430	29,388 51	3,994 05	33,382 56
Big River.....	2	253·75	18,192,069	5,835,600	.. .	14,742 04	1,286 75	16,028 79
Nisbet and Pines .	4	80·69	....	. .. .	10,073	2,238 05	173 15	2,411 20
Total.....	**46**	**1,202·81**	**60,282,160**	**14,739,921**	.....	**4,636,860**	**5,453 95**	**51,822 55**

ALBERTA

Crowsnest	11	254·94	5,666,163	1,836,650	1,457,981	7,539 88	1,374 70	8,914 58
Bow River	14	327·90	2,345,561	.... .	1,943	1,246 51	1,825 60	3,072 11
Clearwater.....	4	371·52	. .....		191,596	7,633 84	1,887 30	9,521 14
Brazeau.....	11	163·85	692,756		176,191	7,387 13	1,131 30	8,518 43
Total.....	**40**	**1,118·21**	**8,704,480**	**1,836,650**	.....	**23,807 36**	**6,218 99**	**30,026 26**

BRITISH COLUMBIA

Total.....	**11**	**133·57**	**1,011,965**	....	.....	**940 26**	**667 85**	**1,608 11**

GRAND TOTAL

Grand Total?.....	**112**	**2,596·78**	**70,591,102**	**16,576,571**	.....	**71,463 05**	**13,062 75**	**84,525 80**

*The figures in this column indicate the number of units in which the dues were calculated. They include 11,417 fence-posts, 2,661 cords of fuel-wood, 325 cords of pulpwood, 73,347 lineal feet of piling, 1,825,978 railway cross-ties, 5,926 rails, and 1,457,442 lineal feet of mine props.

APPENDIX No. 1

REPORT OF THE CHIEF OF THE TREE PLANTING DIVISION, NORMAN M. ROSS

Conditions affecting tree-growth and the setting of new plantations during the growing season of 1921 were on the whole very favourable. The inspectors all report a very much larger proportion of newly planted stock as having taken root and made satisfactory growth. In southwestern Manitoba and southeastern Saskatchewan there was a restricted area which experienced extreme heat and a period of drought late in July, which caused many young plants, which had started to grow earlier in the season, to dry out and die in late summer.

Although there is more general interest than ever before being shown in regard to tree planting, general conditions affecting agriculture in the West—principally labour and unsettled markets—make it impossible at present for a very large proportion of farmers, who are otherwise anxious to do so, to undertake any tree-planting work. These conditions will gradually become more normal and from all indications we may then expect that tree planting generally will be given an enormous impetus.

Practically no serious damage occurred from winter-killing in any section during the winter of 1920-21. At the Indian Head Nursery Station the fruit trees came through in splendid condition and in addition to quite heavy crops of plums some eight different varieties of standard apples matured fruit of good size and quality. Inspectors also report many instances where individual farmers were having excellent results with plums and crabapples, where grown under protection of shelter-belts.

The inspectors in all districts report on the very favourable results with the evergreens sent out from the nursery station. When once established these make very satisfactory growth and are certainly the ideal trees for permanent prairie planting.

NURSERY WORK

All classes of stock made good growth in the nurseries. Our caragana plots suffered from a severe wind storm just as the seed was germinating, and as a consequence about 50 per cent of the crop was lost. The evergreens, both new transplants and freshly sown seed-beds, came along well.

Distribution.—Shipping of broad-leaved stock commenced April 23 and was completed May 5. Evergreens were shipped May 10 and distribution completed May 12.

DISTRIBUTION OF BROAD-LEAVED STOCK IN 1921

Number of applicants receiving trees	3,603
Seedlings and cuttings distributed	4,083,975
Average number per applicant	1,092
Number of applicants on inspection list, 1921	7,561
Number of new applications for 1922, approximately	2,226

At the Indian Head and Saskatoon Nursery Stations the following broad-leaved material is available for distribution this spring (1922): Manitoba maple, 3,554,500; green ash, 347,000; Russian poplar, 1,176,000; red willow, 1,292,500; acuteleaf willow, 831,500; laurel willow, 308,775; caragana, 839,000; total, 8,349,275.

CONIFERS

Applicants numbering 240 were supplied with coniferous (evergreen) transplants, at a nominal charge as follows: white spruce, 18,750; jack pine, 5,000; Scotch pine, 22,750; total, 46,500. In addition to these 57,000 pine and spruce seedlings and transplants were shipped for planting on the Manitoba and Saskatchewan forest reserves, making a total of 103,500.

Collection of Seed.— Owing to various causes this was a very poor season for the collection of maple seed. In most districts seed failed to set and later in the season, owing probably to a few weeks of excessively hot weather, what seed did set in certain localities did not fill. We were able to secure only 166 pounds of maple seed and 658 pounds of ash seed. About 150 pounds of caragana seed were collected at the Indian Head Nursery Station, and 150 pounds at the Saskatoon Station.

Of the coniferous species 267 bushels of jack pine cones yielding 104 pounds of clean seed were collected in the forest reserves in northern Saskatchewan and in the Riding Mountain reserve. The cones were shipped to Indian Head and the seed extracted and cleaned at the nursery station. Forty-four bushels of lodgepole pine cones were collected in the foot hills of the Rocky mountains. These yielded only 7½ pounds of clean seed, the dry season probably having affected the filling of the seeds. It was not a seed year for white spruce in any part of the West. We were able to secure six bushels from a few trees at the Indian Head Nursery, from which 5 pounds of clean seed were extracted.

Distribution of Seed.—Fifty pounds of maple, 25 pounds of ash, and 100 pounds of caragana seed were sent out in March, 1922, to 105 applicants. For experimental work and nursery beds 10 pounds of spruce seed and 100 pounds of jack pine were sent to different forest reserves.

Permanent Plantations.—All the permanent plantations made very good growth, on the average considerably more than in the season of 1920. Measurements of growth were taken as usual in all the older plantations, which entailed measuring several thousand individual trees.

Injurious Insects.—The larch saw fly appeared again in considerable numbers in some of the tamarack and larch plantations, but the trees were immediately sprayed with arsenate of lead and no very serious injury resulted. General reports from different districts show that the canker-worm and aphis on the maples were very prevalent especially in southern Manitoba. There were also several reports of the blister beetle affecting caragana, more especially in Alberta and western Saskatchewan.

PLANTING IN RESERVES

In *Spruce Woods* reserve 43,000 jack pine seedlings were set out covering fifteen acres of new planting; twenty-six acres were sown broadcast with 96 pounds of jack pine seed and half an acre with two pounds of spruce seed. Reports of the plantings on this reserve were very disappointing this season. Following three years of very scant rainfall the summer of 1921 appeared much more favourable, but in this particular district there were about two weeks of intense heat during July, which on the light, sandy soil practically burned up everything. Only a very small percentage of the newly planted stock survived and even the older plantings suffered very considerably. The areas which had been seeded showed some germination in the early summer but the young seedlings were apparently scorched up during the hot spell.

In *Cooking Lake* reserve about five acres of new plantation were set out in the spring of 1921, using stock raised on the local nursery, also a few small, experimental areas were seeded. At the end of October, 87 per cent of the stock planted was living.

In *Cypress Hills* reserve a total of about one and three-quarter acres of experimental planting was done, using small stock grown in the local reserve nursery.

VIDAL'S POINT

Forty-two permits were issued for camping privileges on the public park at Vidal's Point in the Qu'Appelle valley. This is the only available public property bordering on the Qu'Appelle lakes which can be used for general recreation and every season attracts an increasing number of holiday seekers. There is a limited area available for camping purposes and another portion with an excellent bathing beach and fairly well treed, for general picnicking purposes. The increasing use of this property by the general public necessitates certain improvements for sanitary purposes, also the erection of bathing houses, wharves, etc. The Forestry Branch having no appropriation for such purposes, this property was in October, 1921, established by Order in Council as a Dominion park, to be known as Vidal's Point park, and has been placed under the administration of the Dominion Parks Branch.

APPENDIX No. 2

Report of the District Forest Inspector for Manitoba, H. I. Stevenson

The work of the Forestry Branch in Manitoba is the administration of the Dominion forest reserves, the fire protection of all timbered lands lying outside the forest reserves and the fire-guarding of the Hudson Bay railway, which is at present considered as being under construction.

The timbered lands outside the forest reserves are divided into three fire-ranging districts: (1) The Pas, comprising the northwestern part of the province; (2) Manitoba North, comprising the northeastern portion; and (3) Manitoba South, comprising the territory in the neighbourhood of lakes Winnipeg and Winnipegosis and the eastern portion of the province from the International Boundary to Berens river.

FIRE PROTECTION

Fire protection in the forest reserves is carried out by means of mounted forest rangers, lookout men stationed in observation towers, and voluntary fire guardians in the surrounding settlements. On the forest reserves of Manitoba there is a very complete system of roads, trails, and telephone lines which enables forest officers to locate fires quickly and to reach them with fire fighting crews and apparatus before they have burned over any great area.

Outside the forest reserves, patrolling is done almost entirely by canoes. The men work in pairs and travel through the different systems of waterways. These waterways provide the only means of travel in the northern part of the province, and patrols are laid out along the different rivers and lakes. Some of these patrols are from one hundred and fifty to two hundred miles long.

The season of 1921 was remarkably free from fires. During the early spring conditions were bad on the more open parts of the forest reserves. The ground dried out before the vegetation became green, and high winds prevailed. The result was that we had several large grass fires which destroyed some young poplar reproduction of little value, but no trees of valuable species or merchantable timber were destroyed. In all, fifteen large fires (those burning over 10 acres) occurred in and adjacent to the forest reserves, but, as previously mentioned, these fires were confined to grass lands and young poplar. Fires in the neighbourhood of forest reserves are, in the majority of cases, caused by the carelessness of settlers in clearing land and burning hay sloughs but greater care is being shown by the settlers each year.

Outside forest reserves eighteen fires were reported, four of which were located and extinguished by the use of seaplanes. These fires were also confined to grass lands, muskegs, and to scrub jack pine growing on rocky ridges. No valuable commercial timber was destroyed. These fires all occurred early in the spring and in practically all cases were caused by winter camp-fires. It is the habit of trappers in the northern districts to camp in the bottom of dense spruce muskegs during the cold weather, so that they may be sheltered as much as possible from the wind. These camp-fires burn down into the moss and peat, and in the early summer break to the surface and spread. During the past winter the endeavour has been made to warn trappers and travellers in the north of the danger resulting from these winter camp-fires, and it is hoped thus to lessen the number of fires from this cause. During the latter part of the season rainfall was abnormal and no fires were reported during August, September, and October. In addition to the above-mentioned large fires, fifty-three small fires were reported, these were suppressed without having done any damage.

During the spring of 1921 several amendments were made to the Manitoba Fires Prevention Act by the Provincial Legislature. One amendment gives police authority to Dominion forest officers and the right to question any man as to the route travelled by him, thus enabling them to keep a better check on persons travelling through the district, particularly in the northern areas. The second amendment makes it an indictable offence to leave a camp-fire burning, whether or not damage was caused by the fire spreading. The third amendment gives authority to take settlers any distance to a fire north of the fifty-third parallel. The fire laws of this province are excellent. Forestry Branch officers receive every assistance from the provincial authorities and Dominion forest and fire rangers are appointed special fire guardians to administer the Manitoba Fires Prevention Act. During the past season numerous prosecutions were necessary and fifteen convictions were obtained against settlers for burning brush without permits and refusing to assist in extinguishing fires.

Two gasolene-car patrols were maintained on the Hudson Bay railway, as it was necessary to follow each train over the road. A great many small fires were put out during the season by these patrols and the dangerous portion of the roadbed cleared when occasion arose.

AEROPLANE PATROL

During the summer of 1921 the Canada Air Board established a seaplane station at Victoria Beach to be used under the direction of the Forest Service. Three machines were stationed there (two F3's and one HS2L) and patrols carried out from the Winnipeg river to Norway House, observing the territory between lake Winnipeg and the Ontario boundary and territory adjacent to Norway House, Cedar lake, lake Winnipegosis, the Waterhen, the northern part of lake Manitoba and lake St. Martin. In all, about eighteen million acres of timbered lands were constantly under observation by seaplane patrols. A number of fires were located by the planes.

Crews, tools, and provisions were transported, and the fires suppressed. In addition to actual work done the seaplanes had a big moral effect on the people within the territory covered, and in all phases of the work fully demonstrated their value.

IMPROVEMENTS

Improvement work on the forest reserves was largely confined to the repairing of roads, trails, bridges, and telephone lines; also the general maintenance of buildings. Owing to the excessive rainfall during the latter part of the season, the ranger personnel was kept busy repairing washed-out bridges and culverts. During the summer 190 miles of fireguard were ploughed or disked, and approximately 25 miles of telephone line rebuilt on the Duck Mountain forest reserve. The telephone lines on all reserves were gone over and repaired, and approximately 250 miles of road were widened and repaired. The telephone lines in this district are now in good condition.

A 60-foot steel tower was moved from the old Roblin ranger district to a point near the Dauphin ranger station on the Riding Mountain forest reserve, erected in a good position and connected with the Central telephone line. On the Duck Mountain reserve a new steel tower was erected in the Pine River district on the Garland-Singoosh road. This tower commands a view of practically the whole eastern boundary of the Duck Mountain forest reserve and also the territory east of lake Winnipegosis.

Two new cabins for fire rangers were built, at small cost, on the Hudson Bay railway, one at Mile 42 and the other at Mile 185. There was a distinct decrease in the cost of labour and material this year, with the result that practically all improvement work was done at less cost than during the preceding year.

SILVICULTURE

There was a noticeable falling off in the number of permits issued during last season, not more than one-third the usual number of permits being issued. This was due to the extreme financial depression in the country, which practically stopped all building in the rural districts. While this fact results in a very great decrease of revenue it is in some respects an advantage, as the amount of merchantable timber on forest reserves is limited, and heretofore in order to supply the demands of the settlers we have perhaps been cutting more timber on the reserve than is consistent with good silvicultural practice. Another distinct advantage in this connection is the fact that it permits the giving of more careful supervision to the cutting being done.

During the summer a number of new sample plots were laid out, principally in jack pine; and thinnings made of stands of various ages to different degrees of density. Nine new plots were seeded or planted and blanks filled in the existing plantations. Owing to the very dry period at the commencement of the season a great many trees died in the plantations, in some cases from 30 to 40 per cent being killed by drought. A thorough study of reproduction on the Riding Mountain forest reserve was made by Mr. W. N. Millar, assisted by officers of the district, and a number of studies proposed which will be worked out this year.

A large area of jack pine on the Riding Mountain reserve, in the neighbourhood of the Swanson cabin, was surveyed and estimated for future sale.

SURVEY AND ESTIMATE

A survey and estimate was made of a part of the territory east of lake Winnipeg and north of the Winnipeg river, two parties being employed. These parties were assisted in their work by seaplanes and the work checked by aerial photographs. A

preliminary aerial reconnaissance by the officer in charge of the party enabled him to lay out the work to much better advantage than he could otherwise have done. This work will be continued next season.

GRAZING

Grazing is permitted on all forest reserves in the province and several different methods of handling stock are provided. On the southern reserves there are two large grazing enclosures where the Branch accepts the stock and pastures them, providing watering-places, salt, etc. There is a herder in charge, whose duty it is to look after the stock and enclosure. From three to four thousand head are grazed annually in these enclosures. In addition to this, open or fenced grazing is permitted on all reserves. In some cases stock associations are formed by the farmers in a district, who employ their own herder, build fences, etc., and, under direction, manage the range allotted to them. In other cases individuals take out permits for open grazing, or provide their own fences. It is expected that grazing on forest reserves will greatly increase after the present depression, as the methods of handling this part of forestry work have given excellent satisfaction. Stock grazed last season left the reserves in fine condition.

USE OF FOREST RESERVES FOR RECREATIONAL PURPOSES

There has been a decided increase in the demand for lots in the summer resorts in forest reserves in this district. A new resort, known as Benito Beach, was surveyed on the north side of Madge lake. Forty-seven lots were laid out and about one-third of these are already taken up. There is also a big demand for lots at Clark Beach resort on Clearwater lake, in the Riding Mountain forest reserve. All the lots originally surveyed have been taken up and applications have been received from a number of persons, which will necessitate laying out additional lots at once. There are now five summer resorts on forest reserves in this district and requests have been received for new resorts to be opened up on other parts of the reserves.

The whole of the Riding Mountain reserve has been closed to hunters by the province, which is responsible for the protection of game, as, owing to the accessibility of this reserve, big game, particularly, were being killed off. It is hoped this will save from extermination the large herd of elk on this reserve. Assistance was given by Forestry Branch officers to the provincial game department in protecting the game on this and other reserves.

APPENDIX No. 3

REPORT OF THE DISTRICT FOREST INSPECTOR FOR SASKATCHEWAN, C. MACFAYDEN

The work of the Dominion Forestry Branch in the province of Saskatchewan falls under two heads: first, that arising out of the administration of the forest lands established as Dominion forest reserves; second, that in connection with the protection from fire of all timbered lands prior to their being logged and brought under cultivation, or established as further reserves. The fire-protection work also includes that arising from the protection of forested lands traversed by railway lines, a special organization, co-operating with the officers of the Board of Railway Commissioners, being maintained for this purpose.

During the year under review, no major changes have been made in the status or area of the fifteen reserves within the province, although as may be expected, the work of administration increases steadily as the reserves are gradually brought under more efficient and intensive management. Compared with the preceding two years, there were very few applications received to have lands withdrawn from the reserves for agricultural purposes, although there was a number of isolated sections, or parts of sections, recommended for withdrawal, when, upon a thorough examination, they were deemed to be of agricultural value. With the exception of a few cases that are yet pending, one of which involves a considerable area, it is believed that the established reserves are free of any but a negligible area of agricultural lands. On the other hand, the area of lands outside of forest reserves, on which the Forestry Branch maintained a fire-protective force was reduced to a considerable extent, in the belief that forest protection should not be extended to lands that must ultimately come under the plough, except insofar as fires in such districts endanger neighbouring forest lands, or carry a valuable stand of timber. It is not the policy to continue the protection of poplar lands removed from railway facilities, and which, when cleared, will fall to the agriculturist, but rather, to protect only those lands that should be kept permanently under a forest cover. For this reason, the tendency is for the fire-protection work to be each year crowded farther and farther north, until the northern line of future agricultural settlement is reached. Any lessening of the fire-protection work in this way is, however, offset by the necessity of increasing the protection given to the areas of strictly forest lands in the north, and those bordering the line of settlement.

FIRE PREVENTION AND SUPPRESSION

The year was an unusually favourable one in the number of fires occurring, and the expenditures made in their suppression. There occurred, in the forest reserves and the lands protected outside of these, nine large fires or fires covering ten acres or more, and forty-six small fires or fires of less than ten acres, requiring an expenditure of only $20.66 for labour outside of the ranger staff in extinguishing them. These fires were almost evenly divided between the forest reserves and the fire-ranging districts. It is particularly gratifying to note that less than one fire in six gained anything like large proportions, indicating efficiency on the part of the rangers charged with the detection and suppression of fire.

IMPROVEMENTS

Because of the very favourable fire season, it was possible to devote considerable time and funds to the construction of improvements required on the forest reserves and in the fire-ranging districts. During the year, the accommodation for the reserve staffs was increased by the construction of two standard frame ranger houses. One of these on the Sturgeon forest reserve, replaces an old log building no longer of any value, and the other is the commencement of a station to serve as the headquarters of the eastern half of the Porcupine forest reserve, and situated close to Birch river in Manitoba. Six log cabins were put up by the forest rangers on the northern reserves. These are so situated as to serve as bases from which to work on fire-fighting, or on trail, telephone, or fireguard improvements, and also as storehouses for fire-fighting equipment and emergency fire-fighting rations.

Two 80-foot steel towers were erected, one on the Fort à la Corne forest reserve and the other on the Nisbet forest reserve. The tower system on the latter and the Pines forest reserve is now complete, with seven towers all visible from a water-tower in the city of Prince Albert, which latter, with the co-operation of the city, is used as the central station. An Osborne Fire Finder, purchased for use on the latter tower,

arrived too late in the season to be mounted and used, but is in readiness for next year. A number of temporary towers were erected of framed timbers during the summer, at suitable points throughout the reserves and fire-ranging districts; not so much as a part of a regular lookout system, as an aid to the rangers when on other work, and removed from telephone communication with the regular system.

Approximately forty-two miles of new roads were built during the year. This is exclusive of repair work done on existing roads or trails that were followed for part of the distance in each case. Eight and one half miles of road were added to the Caribou road crossing the Big River forest reserve from east to west, leaving approximately fifteen miles to be completed next year. Twenty-two miles were completed on the Fir River trail, connecting the headquarters of the Pasquia forest reserve with the Carrot River administrative station. On the Porcupine forest reserve, about ten miles of new road were constructed in improving an old trail from the Piwei cabin to the Swan River cabin. In addition to the foregoing work on new roads, a large amount of labour was expended in maintaining or improving all existing roads and trails, a large part of this being put on corduroying and the construction of culverts and small bridges.

During the year, the telephone systems on the northern reserves were added to by fifty-four miles of new line. The headquarters of the Big River forest reserve were connected with the Bodmin lookout tower, the wire being strung for a distance of five miles on the Canadian National Railways telegraph poles. On the same reserve, the Caribou telephone line was pushed forward eleven miles to within thirteen miles of Gutches cabin, the proposed western terminus. Twenty-seven miles of new line were constructed on the Porcupine forest reserve, in connecting the system with the Swan River ranger station. The new headquarters of the Fort à la Corne forest reserve were connected with the reserve system by the construction of ten miles of new line. The same headquarters were given connection with the Glenmary Rural Telephone Company's system, so that the reserve can now be reached over the long distance lines from the inspector's office, a need that has been much felt in the past. All existing lines were kept or put into good repair, and at the end of the year a carload of wire was purchased for the coming year's work.

A rather ambitious programme of improvement work was laid down for the fire-ranging staff, especially in the northern districts removed from settlement, where it is believed that any improvements which facilitate travel will win for us the greater co-operation and sympathy of the resident and travelling population. As an instance of such improvements, it may be mentioned that on the Montreal river two canals were dug by the fire-ranging staff, shortening the river by about five miles. Such a work is not likely to go unnoticed or unappreciated by a traveller, especially should he be heavily loaded and travelling upstream. A special effort was made to clear, straighten, and widen all portages, so as to lighten the arduous work of carrying over from one waterway to another. In the belief that our northern watercourses are extremely bewildering to a traveller not perfectly familiar with them, due to the numerous lakes, bays, and channels, a start was made to mark the most frequented routes so plainly that they could be followed by even a novice. Signs of characteristic shape, and discernible at long distances, are being erected at all portages, outlets, and inlets of lakes and at suitable points along the route. On the rivers and lakes in low-lying country, where good camp sites are infrequent, suitable places for this purpose are being marked, and where necessary, cleared of brush and overhanging trees or bushes, so as to allow of ready access from the water. Inexpensive log cabins are being erected at strategic points, for the storage of fire-fighting equipment and supplies, and as more comfortable quarters for the ranging staff during stormy weather. The work of erecting lookout towers of framed timbers at suitable points was proceeded with as in former years, and each canoe route has now several of these scattered along it. These enable the ranger to get a clear view of a much greater part of his territory than he can see while travelling.

GRAZING

Owing to the abnormal conditions of the last two years existing in the stock industry, the number of permits issued and the number of stock grazed on the reserves during the past year show a decided decrease over last year. Unfortunate as the decrease in these numbers may be, it is very evident that it is not due to any opposition to the grazing regulations in force on the reserves, as there is a rapidly growing appreciation of these among stockmen using the reserve for grazing purposes. The decrease is fairly uniformly distributed over practically all of the reserves, and the percental decrease is probably no more than has taken place in the number of stock in the province as a whole. Approximately 770 permits were issued, authorizing the grazing of, in round figures, 35,500 head of stock as against 885 permits issued last year for about 43,000 head. The decrease applies to all classes, including horses, cattle, and sheep. For these reasons there was no increase in the use made of the large northern reserves, such as was expected. The great bulk of the stock continues to be ranged on the smaller reserves situated within the prairie settlements, but as pointed out in previous reports, there are much larger areas of grazing lands within the northern reserves, and with the return to normal conditions in the industry, it is natural to expect that these lands will be utilized and the tide gradually turn in favour of the northern reserves as far as numbers are concerned.

Two new co-operative associations were formed during the year, one on the Ellis forest reserve and one on the Nisbet forest reserve. This plan of grazing the stock of a district on a co-operative basis continues to grow in favour, and it is interesting to note has been recently followed in several districts in the province where stock is being run on lands outside of the forest reserves.

Range conditions during the year were most favourable, good forage being abundant in practically every district. Owing to the understocked condition of many of the ranges, there is at the end of the year a plentiful supply of well-cured forage to care for the early grazing next year. Year-long grazing was, so far as possible, discontinued this year, with a view to increasing the summer capacity of the range and encouraging the growing of winter feed.

SILVICULTURE

Owing to the financial depression existing throughout the year, especially in the farming districts, the material cut from forest reserves under authority of permits, shows a small decrease in most classes, as compared with the previous year, although with this one exception, it is greater than any year previous, and this use of the reserves may be said to be steadily growing. The number of permits issued totalled 1,425, one-third of these being free of dues. A remarkable increase is noted in the number of railway ties taken out under permit, over 48,000 of these cut as against a record last year of slightly over 11,000. A considerable increase was also made in the fuel-wood taken, which amounted to over 35,000 cords, over two-thirds of which total was for sale. There is every indication that an increasing quantity of this product of the reserves will, each year, be cut, as the prairie population, more and more, take this means of securing their summer fuel. It is interesting to note that of the total amount of cordwood cut almost one half was taken from the Nisbet forest reserve, in the immediate vicinity of Prince Albert. This is due to the market for fuel in this city itself, and the comparatively short freight haul to Saskatoon which takes any surplus. Another reason was the plentiful supply of labour in this city during the past winter.

The increase in the material taken each year under permits is welcomed, in view of the fact that the large bulk of the material allowed to be taken under permits

is fire-killed, and in this way the reserves are being cleared of what constitutes a fire menace to the remaining green timber. Brush disposal in conformance with the regulations has also been most successful in these operations, and in the case of cordwood at least, it has been possible to have all material, regardless of its size and condition, utilized.

The timber sale business remained about stationary, except that fewer new sales were made than last year. The quantity of timber removed from the fourteen sales operating was approximately 5,250,000 feet board measure, as against a little over four million feet last year. Three new sales were made, involving altogether about 8,750,000 feet board measure. Brush disposal and other cutting regulations are being satisfactorily complied with and are increasingly easy to enforce.

Investigations and Planting.—Very little tree-planting stock was available for use on the forest reserves, and planting was limited to the Nisbet forest reserve, where 1,500 Scotch pine and 1,500 jack pine were set out in experimental plots. Owing to the rains before and following this planting, the stock did remarkably well, and at the end of the year hardly a single failure was noted.

In preparation for more extensive plantings, small nurseries were started on the Dundurn and Pines forest reserves, but the seed not being put in as early as it should have been, the results were not quite satisfactory, but were such as to encourage the extension of this work another year. From experience gained in experimental plantings, there does not seem to be any reason why this should not now be done on a larger scale with even better results, especially when the stock is grown on the reserves.

During the latter part of the year, studies were made of the form and taper in jack pine, spruce, and tamarack, to assist in the preparation of yield tables.

SURVEYS

A reconnaissance survey was made by a party of three, of the Bear lake and Mossy river country lying east of Montreal lake and west of Beaver and Cumberland lakes. The purpose of the survey was to correct and add to our existing maps, and to gain some idea of the types and amount of timber in that district. The information gathered shows only a comparatively small quantity of timber merchantable on to-day's standards.

During the year a start was made on a detailed survey of the types and amounts of timber standing on the different forest reserves. At the same time, all topographic features are being plotted. This work is being carried on by the reserve staffs. A survey was started towards the end of the year to define the area of a recently discovered infestation by bark beetles.

EQUIPMENT

In addition to keeping up the supply of ordinary tools, some special equipment was purchased. This included a motor-truck and two motor-cars, which were very useful in administrative and protective work; two detachable motors for use on row-boats used by river patrolmen; and two railway power speeders for running on railway lines through reserves.

APPENDIX No. 4

Report of the District Forest Inspector for Alberta, C. H. Morse

In the Alberta inspection district the Forestry Branch is responsible for the administration and protection of the Dominion forest reserves and the protection of timber on other public lands. We have, therefore, two rather distinct organizations, one concerned with the forest reserves or national forests and one concerned with the districts where fire protection is our only duty. The latter branch of the work includes co-operation with the Board of Railway Commissioners for the protection of timber along railway lines. There are three fire-ranging districts under the supervision of this office and these cover the wooded areas of the province not included in the forest reserves. They also include the important timber-lands of the territories to the north of the province of Alberta.

The forest reserves which cover an area of approximately 18,690 square miles have been definitely reserved for the production of timber and for their beneficial effect on stream-flow. It is the duty of the Forestry Branch, therefore, to protect the forests growing on them and to improve and extend the stands of timber by proper silvicultural practice. Unfortunately during past years repeated fires have reduced the mature timber to a very small percentage of the entire stand, but the remarkable regenerative faculty of our native tree species has provided fine young crops of timber, which will be extremely valuable in the not far distant future. Mature timber is sold, but only under conditions which make for safety from fire and which will ensure the permanence of the stand. The forest reserves and parks now comprise about 10 per cent of the area of this province. Recent surveys in the north have shown that there are other large areas of non-agricultural land capable of growing excellent timber which should be added to the existing forest reserves, thus increasing their area up to about one-third of that of the entire province. If these forests are properly administered and protected there is no doubt that the province will be assured of adequate timber supplies.

FIRE PROTECTION

The summer of 1921 was one of unusual fire-danger, although the fire damage was not greater than that which usually occurs in a normal season. Spring fires did not occur to any great extent in the south country as the season there was rather moist, but in the north the situation was decidedly different. In the Edmonton fire-ranging district 76 fires were reported during April and 121 during May. No serious fires occurred on the forest reserves during the spring or early summer months. The late summer period was unusually dry and when the grass was killed by frosts at the beginning of September the fire-danger became very acute. This peak was passed safely, except for one bad fire in the Crowsnest forest. In the north the September storms were lighter than usual and they were followed by a period of extraordinarily dry weather which made October the most dangerous month of the year. It was not until November 7 that general snow-storms disposed of the fire-danger for the year. October contributed 30 per cent, and May 22 per cent of all the fires.

The increase in the number of fires caused by settlers burning brush is remarkable. In the districts outside the forest reserves settlers caused 45 per cent of the fires and railways 26 per cent. Within the forest reserves railways were respon-sible

for 80 per cent of the fires. It is only fair to state, however, that most of these were very small ones which were extinguished by railway patrolmen within a few minutes after they had started. There was an unusual amount of brush-burning by settlers for clearing land in the fall of 1921. North of the Red Deer river the smoke was so dense during all the autumn that it was very difficult to detect new fires. Many settlers had crops and buildings burned by their own or their neighbours' fires, and even towns were in danger at times. In Edmonton the city fire department had to make repeated trips to the outskirts of the city to extinguish fires spreading from the brush country. It was found necessary in order to secure the observance of the law to institute a number of prosecutions for neglect of proper precautions. Eighteen persons were convicted and one offender received a jail sentence. It is hoped that these prosecutions will have a salutary effect.

Of the 842 fires reported by forest officers in this district, 215 occurred on the forest reserves and burned over a trifle less than one-fifth of one per cent of the forest reserve area. Most of the damage was done by two fires, one on the Crowsnest and one on the Brazeau forest. Fanned by extremely strong winds these fires spread out of control for one day, but after the organized crews reached them the fires made little or no further progress.

During the year the Legislature of the province of Alberta amended the Provincial Fire Act. As this is the Act under which Dominion forest rangers work, who are employed outside the forest reserves, this new legislation is of the greatest importance to this branch. The most important feature of it is that Dominion forest and fire rangers are specifically named as *ex officio* fire guardians under the terms of the Act. The Lieutenant Governor in Council is empowered to declare certain portions of the province to be areas of special forest fire risk and to make regulations concerning them. The powers of fire guardians are considerably increased and the penalties for infractions of the Act are made more severe.

AEROPLANE PATROL

Last year it was reported that an air patrol had been established over the Bow River and Crowsnest forests by the co-operation of the Air Board. This patrol was put into effect in September, 1920, but was rather too late to be an important factor in forest fire protection that year. The usefulness of aeroplanes for our work was nevertheless clearly demonstrated and plans were made for a continuation of the patrols during the season of 1921. A purely temporary aerodrome had been established at Morley, a village on the Canadian Pacific railway at the edge of the mountains, forty miles west of Calgary. It was found, however, that the winds at this point were too severe for safe landings and the soil was too gravelly to level without sacrificing all hope of establishing a new sod on it. After considerable study of the sites available the Air Board established a new aerodrome at High River. At this point four hangars have been put up to house aeroplanes, and several permanent buildings have been constructed. They consist of an administration building comprising offices, store-room and garage, a wireless building, and a workshop large enough to accommodate an aeroplane without dismantling. The wireless station is particularly powerful and has a steel mast, 190 feet high, for an umbrella aerial.

Two patrols were carried out almost daily during the summer, one going south over the forest reserves to the International Boundary, and one going north to the divide between the Red Deer and Clearwater rivers. Reports of fires were sent by wireless from the aeroplanes to the air station and from there by telephone to the rangers concerned. Forest officers also used the aeroplanes at various times to make a reconnaissance of a fire and determine the progress of fire-fighting operations. Leaflets warning the public concerning the danger of forest fires were dropped over towns during fairs and sports days.

IMPROVEMENTS

For the proper administration of a forest there must be provided telephone lines, roads, and trails; and, in order to have forest officers located at strategic points, it is necessary to have houses and cabins constructed. Trails, roads, and telephone lines are built by crews of labourers under the direction of the local ranger when he can be spared from his forest protection and administration duties. Cabins are built entirely by ranger labour during the winter months.

During the year considerable progress was made in completing the improvement programme for the forest reserves. On the Brazeau forest we constructed a house for the supervisor, a standard ranger station, and a small office building. On the same forest four miles of fireguard were built along a particularly dangerous stretch of railway. This fireline was constructed by clearing an extra sixty feet outside the right-of-way and plowing six furrows on the outer edge of this clearing. With such a fireguard the right of way and the extra clearing can be entirely burned over each spring without danger to adjoining stands of timber, and that particular section of the railway is then practically safe from fires. The importance of railway fireguard construction on the Brazeau forest is indicated by the fire schedule, which shows that out of 187 fires which occurred on the reserve during last season all but six were caused by railways. Next year it is hoped to construct fireguards along other dangerous parts of the 70 miles of railway under operation within the Brazeau forest.

On the Cypress Hills forest there were constructed 34 miles of telephone line to link up the supervisor's headquarters with the most remote ranger station. In building this line creosoted pine poles were used, for it has been found that untreated pine or spruce poles will not last more than about six years. The plan of applying preservative with a brush to the butts of seasoned poles has been tried, and while this treatment is fairly effective it has been found that the penetration of the preservative is not sufficiently uniform. In this case the butts of thoroughly seasoned pine poles were treated by the open-tank process. This consists of placing the poles in a tank of hot creosote oil until the wood is well heated and then transferring them immediately to a cold tank. By varying the length of time during which the poles are left in the tanks the degree of penetration can be controlled. It is expected that poles so treated will have a length of life about equal to that of cedar.

On the Bow River forest there were constructed fifteen miles of graded road leading to ranger stations from the forest reserve boundary. On the northern reserves no roads were built, but 176 miles of pack-trail were constructed. Most of this was built on the Lesser Slave forest where a great deal of such improvement work is necessary to open up the country. On the same forest one lookout tower was built. At various other locations on the forest reserves there were built during the year five log cabins, two barns, two railway-speeder houses, a machine shed, a pump-house, and a storehouse. A great deal of maintenance work was also done to keep roads, trails, telephone lines, and buildings in repair.

SILVICULTURE

Timber Sales and Permits.—The amount of timber cut in this district under the authority of timber sales and permits shows considerable increase over previous years in spite of the depression which has been so general in the timber trade. Fourteen sales were in operation during the past year of which eight supplied saw-timber to local mills and six provided mine-props and lagging for Alberta coal mines. The year's cut under authority of timber sales alone totals about 8,500,000 feet board measure, 2,000,000 lineal feet of mine-props and 2,000,000 lineal feet of lagging.

A special effort has been made to utilize dead and fire-killed timber as much as possible, in order to conserve the supply of growing timber which is readily accessible

to railways or settlements. With this end in view considerable work was done in locating and mapping out areas of fire-killed timber accessible to mines and railways and special inducements were offered to timber operators to use this material. As a result, the cut of mine material mentioned above is more than half fire-killed timber. In addition to this, about 750,000 lineal feet of mine-props and 550,000 feet board measure of saw-timber, as well as large quantities of dry cordwood, fence-posts, poles, building timber—all fire-killed timber—have been disposed of under permit.

The mining and lumber companies throughout the province have, as a rule, given us their hearty co-operation in our attempt to conserve so far as possible the green timber in the vicinity of their operations. They have willingly used all fire-killed and diseased material before cutting green timber and have also closely utilized all timber sold them. In very few cases has there been any difficulty in enforcing regulations concerning close utilization and brush disposal. This is particularly the case where the operator is more or less permanently located in the district.

Seeding and Planting.—On the Cypress Hills and Cooking Lake forest reserves, both of which are located on the prairies in poorly timbered country, nurseries have been started which are now in a position to supply yearly about 150,000 spruce and pine seedlings for plantations. Last year 13,700 lodgepole pine and 7,200 spruce were planted on these two reserves. In the case of the Cooking Lake reserve good results were obtained from planting seedlings direct from the seed-bed, thus saving the trouble and expense of transplanting.

Considerable work has also been done along the line of direct seeding, both by broadcast sowing on partially prepared ground, and also by sowing on small spots of prepared ground, spaced at definite intervals. At present this work is only in the experimental stage but the results obtained so far are quite satisfactory.

Investigative Work.—Investigative work of many kinds has been carried on under the direction of the staff of technically trained foresters assigned to the district. Growth of timber under different conditions is being studied by means of measurements made annually on trees in sample plots which are so chosen that the different conditions encountered in the forests are represented. This work includes also studies of fungus and insect damage, loss from wind-throw, and other related subjects. Studies have been made to determine the relative germinating qualities of seeds from different sorts of trees on different conditions of seed-bed, and also to ascertain the rate at which reproduction can be expected to come in after cutting the original stand to various degrees of density.

GRAZING

The forest reserve regulations are designed to allow the fullest use of the grazing resources of the forest reserves, consistent with the purposes for which they were created—the production of timber and the protection of water-sheds. Great care is taken to see that the privileges of forest grazing are divided as equally as possible among those entitled to them, and attempts are made to have grazing permittees work together in associations for the improvement of their herds and the conservation of the range.

During the summer of 1921, permits were issued to 587 permittees covering 26,961 cattle, 9,088 horses, and 2,953 head of sheep. No increase was made over the previous year in the number of stock grazed, the reason being that beef prices have been so low that ranchers have not yet brought their herds back to normal size. The winter of 1920-21 was rather mild and stock entered the forest reserves in the spring and early summer in very good condition. Although the rainfall during the summer was slight, the range did not suffer except in a few divisions where a pest of grasshoppers did rather serious damage. Stock left the reserves in good condition,

but as the market has steadily declined for the past two years the prices realized by the permittees have been very low.

Practically all our grazing permits are issued for the Crowsnest, Bow River, Cypress Hills, and Cooking Lake forests. There are considerable areas of excellent forage on the northern reserves but they are as yet too far from the settlements to be attractive to farmers and ranchers. Later, when the country is settled up to the boundary of these reserves, they will support thousands of head of cattle during the summer months and will be the safer from fire by having the forage consumed. Even in the Bow River and Crowsnest reserves there are quite large areas of higher mountain range still unutilized which would do excellently for sheep.

During the summer a grazing survey was made of the Castlemount district of the Crowsnest forest. This work was carried on by a party of three forestry students, working under the direction of the grazing inspector. The object of the survey was to determine the location and extent of the grazeable areas, the character of the forage, and the carrying capacity of the ranges under a system of intensive management. Sufficient data were secured to enable the supervisor to put into effect a plan of grazing management for that district. A collection of forage plants was made by the party and a number of specimens was added to the herbarium of this office.

APPENDIX No. 5

Report of the District Forest Inspector for British Columbia, D. Roy Cameron

The British Columbia inspection district comprises the Dominion forest reserves in British Columbia, and the Coast, Salmon Arm and Revelstoke fire-ranging districts, all situated within the Railway Belt of British Columbia.

FIRE PROTECTION

For the third year in succession this district experienced a fire season of abnormal severity. Conditions paralleled 1920 in that the danger was confined within restricted limits, roughly within the boundaries of the Salmon Arm fire-ranging district and in the forest reserves. In the Coast district, abundant and well-distributed precipitation produced unusually favourable conditions and a very successful season resulted. To a somewhat less extent the same conditions were duplicated in the mountainous area comprising the Revelstoke fire-ranging district. In both these districts, however, a good deal of credit is due to the protective organization for prompt suppression of all outbreaks.

In the Dry Belt and adjacent Shuswap lake area, conditions repeated the 1920 phenomena. A cool spring and rainy June were followed by drought and resultant high temperature during July and August, producing a fire-hazard fully as severe as that experienced during 1920.

Lightning fires, although attaining a considerable percentage in the district totals, were very much reduced in number in the area of high fire-hazard. This feature gave rise to more favourable conditions for control of outbreaks. Also better equipment, particularly gasolene fire-pumps, and adequate motor transport, for the

first time available, enabled the field forces to cope with the situation arising far more successfully than was ever possible before. This combination of circumstances produced results as follows:—

Proportion of large to small fires, reduced from the 1919 and 1920 figures of over 50 per cent of the total, to 32 per cent;
Total area burned over, reduced from 64,336 acres in 1920 to 25,569 acres in 1921;
Loss of merchantable timber, reduced from 148,000,000 feet board measure in 1920 to 13,956,000 feet board measure in 1921;
Acreage young growth destroyed, reduced from 18,500 acres in 1920 to 8,866 acres in 1921.

These encouraging results were attained despite the fact that the total number of fires increased from 408 in 1919 and 422 in 1920 to 445 in 1921. A further index of the relative efficiency of fire control is shown in the figures for the percentage of fires whose cause was unknown. Of the 1921 fires 63 come under this heading, or 14·2 per cent of the total. But of these 63 fires 38 were fires reported along railway lines and confined to the right of way. The railways themselves are responsible for right of way fires, therefore, for purposes of comparison, these 38 fires should be eliminated from the general classification, "Unknown." This reduces the number of fires reported by our regular staff as "unknown" from 63 to 25, and the percentage from 14·2 to 5·6. This last figure constitutes a record in this district.

Of the causes of fires reported during 1921, railways head the list with 186 fires or 41·8 per cent. To these figures should be added, as indicated above, 38 unknown fires, confined to railway right of way, which will increase the percentage of railway fires to 50·3, or over half the total number occurring during the season. Lightning fires assumed second place with a total of 37 or 8·3 per cent as against 39·1 per cent in 1920. Campers came third with 36 fires or 8·1 per cent, closely followed by settlers' fires with 34, or 7·6 per cent. An unfortunate feature of the 1921 situation was the prevalence of incendiary fires, of which 29 or 6·5 per cent were reported. The remainder of the total number of fires was attributed to various causes of which smokers with 16 fires, or 3·6 per cent, contributed the largest number.

Fires Within Forest Reserves.—Forty-seven fires were reported within forest reserves during the season of 1921, 35 large and 12 small. The percentage attributed to the main causes were as follows: Incendiary, 28 per cent; campers and hunters, 28 per cent; unknown, 17 per cent; lightning, 12·8 per cent; and settlers, 6·4 per cent.

Even at the risk of repetition, which may be considered unnecessary, attention should again be called to the important part which lookout stations play in fire protection both within and outside the forest reserve areas in this district. The important function of fire detection has practically been taken over by these stations within the areas which they serve. This allows concentration of suppression forces at strategic points during periods of emergency, with resultant reduction of time in getting work started on the fire lines following outbreaks. Four forest reserve lookout stations were in operation during the season and two more, namely, one on Porcupine ridge in the Tranquille forest reserve and one on Cornwall hills in the Hat Creek forest reserve were partially completed by the close of the field season.

Fires Outside Forest Reserves.—As indicated above in this report the fire situation in the fire-ranging districts was fairly satisfactory during 1921. In the Coast district, losses were reduced practically to nil, only 8,000 feet of timber and twenty acres of young growth having been destroyed. In the Revelstoke district, losses were also negligible. Forest fires destroyed 150,000 feet of merchantable timber and ten acres of young growth. The Salmon Arm district did not fare so well. Within its

borders was concentrated again the high hazard and large percentage of fires occurring during the season. During the month of July alone 55 fires were fought under trying conditions of drought and high temperatures. August proved even worse, being hot and dry with considerable wind. The cumulative effect of continued drought produced particularly adverse conditions from a fire-control standpoint. The occurrence of 68 fires during this month tried the resources of the organization to the utmost. These fires accounted for by far the greater proportion of the total damage incurred during the fire season.

Railway Fire-ranging.—The outstanding feature of the railway fire-ranging situation during the season of 1921 was the reversion to the use of coal by the Canadian Pacific Railway in all oil-burning districts excepting between Field and Revelstoke. This necessitated special attention to fire protection. The first year's operations showed an increase in the total number of railway fires from 90 during 1920 to 214 during 1921. Despite this increase, the season's totals of acreage burned over and damage resulting show satisfactory decreases from 1920. In a large part the credit for this is due to the railway companies themselves, who improved very considerably their patrol work. Particular mention should be made of the section patrol organization installed by the Canadian Pacific Railway, which functioned in a very satisfactory manner.

Of the 214 railway fires, 117 were extinguished before they had attained a size of a quarter of an acre, and of the remainder only 21 exceeded ten acres in area. The percentage of fires attributed to locomotives rose from 54·4 during 1920 to 74·2 during 1921, a direct result of reversion to coal as stated before.

Considerable improvement was effected in right of way conditions throughout the district, though additional work is required on branch lines of the Canadian Pacific railway and on parts of the Kettle Valley railway.

Locomotive inspection was carried out to a much greater extent than formerly, an additional fire inspector having been obtained, largely for this work.

The thanks of this service are due to the responsible officers of the Canadian Pacific Railway, the Canadian National Railways and the Kettle Valley Railway for co operation in carrying out the provisions of General Order 107 of the Board of Railway Commissioners in connection with railway fire protection.

IMPROVEMENTS

Forest Reserve Improvements.—The close of the field season of 1921 was noteworthy in that it saw the final linking up of the remaining forest rangers' headquarters with the superintendent's office by forest service telephone lines. As a result of this work telephone communication can be had with all reserve units, a circumstance which will facilitate to a great extent hereafter, administration and fire protection on forest reserves in this district. The most important project was the construction of a telephone line from Kamloops to Pass Lake ranger station, thence by forest reserve trails to Criss Creek ranger station via Tranquille lake and Little Cariboo plateau. A spur line connects a proposed new lookout station on Porcupine ridge. The total length of this line is something over 37 miles, of which 12 miles is pole line construction and the remainder tree-line. A telephone line ten miles in length connecting Salmon River ranger station with the public works department rural lines at Adelphi post office, and another line 13 miles in length, connecting the Amphitheatre ranger station with Asheroft, were also built. From the last-named point a spur line four miles in length was constructed to the top of the Cornwall hills to provide connection for the lookout station to be installed on that summit. In all over 65 miles of forest telephone line were put in, constituting a record in construction for this district, for one season.

In trail construction the principal project was the South Boundary trail, 11 miles long, built through the Monte Hills forest reserve. In addition short connecting links totalling five miles were constructed at other points. This service in co-operation with the Provincial Roads Department completed during the spring a much needed improvement, in the construction of a cut-off road into the summer resort at Paul lake in the Niskonlith reserve, which eliminates a reverse grade over a hill some 300 feet high.

Maintenance work was carried out on buildings at various reserve headquarters, notably Louis Creek and Trout Lake ranger stations, to put our improvements in proper condition.

Fire-ranging Improvements.—A very important project was completed during the 1921 season in the Salmon Arm fire-ranging district, in the installation and equipment of a lookout station on Eagle Pass mountain, elevation 8,000 feet. This mountain is situated at the head of Crazy creek and affords direct view over the lower Eagle valley, a region of intense fire-hazard. This project involved the construction of 13 miles each of telephone line and trail, and the construction of a stone lookout cabin on the summit. A log cabin, half-way up the trail, was also erected for the convenience of the ranger packing in supplies to the lookout man.

In the Salmon Arm district, also, there were constructed at Sicamous a warehouse and boat-ways required for proper care of equipment, and a cabin at Cinnemousin narrows on Shuswap lake to be used as fire ranger's headquarters.

In the Revelstoke district four miles of the Big Bend telephone line were rebuilt. This was made necessary by the abandonment of the old Big Bend trail, along which the original telephone line was constructed, consequent upon the completion of a wagon road in a different location.

AEROPLANE OPERATIONS

The Air Board provided one HS2L flying boat from the Vancouver air station, which was operated, entirely without the usual and essential accessory facilities, from the beach on the river front at Kamloops, in the same manner as was done during the preliminary experimental operations in the fall of 1920. This machine, and those which subsequently replaced it, were flown from Vancouver to Kamloops, thus eliminating the cost of shipment by freight, which accounted for a large percentage of the total cost incurred in the 1920 operations.

The first machine was delivered on July 12, 1921. It developed defects which although of a minor nature, caused extensive time losses. On August 16 it was replaced by another of the same type. This second plane functioned satisfactorily until September 2, when engine trouble developed. It was returned to Vancouver on September 12, and on October 8 the first machine, rebuilt, was brought back for photographic work. This plane returned to Vancouver on October 14, completing operations at Kamloops for the season.

Seventy-one flights were made in connection with Kamloops operations, of which seven were delivery or return of machines from Vancouver air station. This feature alone accounted for 21 per cent of the total flying time of 100 hours. Flights for this service totalled 57 hours flying time, and an air mileage of 3,771. There were planes stationed at Kamloops for 74 days, on 38 of which, or 47·4 per cent, flights were carried out. These figures show that an air station equipped with one spare machine should be able to provide continuous flying.

An analysis of the work carried out for this service shows that 48 per cent of the flying time was utilized for fire patrol and fire reconnaissance. This is partly due to the fact that planes were in operation largely during the peak of the fire season, when this work was of the most pressing importance. Fire reconnaissance flights in par-

ticular gave the best results in time and money saved, of any undertaken. It was found possible to fly at a comparatively low elevation directly over fires burning. Observations were made of the direction in which fires were heading, the timber values menaced, the location of natural strategic points for control, the best ways of getting men on to the fire-lines, etc. Fire rangers given preliminary flights over fires under their charge were able to obtain this essential information with practically no loss of time.

Exploration and timber examination flights accounted for 19 per cent; administrative work, including improvements, investigation, and inspection, and observation flights for forest officers occupied 13 per cent; photography 9 per cent, and miscellaneous purposes 8 per cent, of the flying time.

Besides operations based on Kamloops, a considerable amount of flying was done for this service from the Vancouver air station, in connection with the Coast fire-ranging district. Altogether twenty flights were made, totalling approximately 2,000 miles. Forty-eight per cent of the flying time involved was used in fire-patrol work; 28 per cent in photographic experiments; 16 per cent in timber reconnaissance, and 8 per cent on administrative work.

The fire-patrol work consisted of week-end flights, mostly on Sundays, covering the lakes and rivers frequented by fishermen and city dwellers holidaying in the woods. The psychological effect of aeroplane patrols produced a very favourable reaction in the public mind, as evidenced by newspaper articles and reports from forest officers coming in contact with people in their districts. It is certain that, as a preventive publicity measure, these week-end patrols have been of immense importance and benefit to the service, in forest protection in the Coast district.

SILVICULTURE

Forest Reserve Operations.—A party of forestry students, to which was attached a technical forester, completed during the field season of 1921, an exhaustive study of the lodgepole pine type as developed on forest reserves in the Dry Belt. Detailed yield figures will be available shortly as a result of this work.

Timber sale business slackened off greatly, due to general adverse economic conditions. Only one small sale was awarded during the year under review. Timber permit business was also stationary.

Tree Seed for Great Britain.—Continued requests by the British Government for large quantities of seed of Sitka spruce and coast-type Douglas fir and hemlock, for use in reforestation work in the British Isles, made necessary the construction of a modern and completely equipped seed-extraction plant at New Westminster. This plant was started September 1 and commenced operations October 15, 1921. Cone collections made by this service totalled 3,237 sacks of Sitka spruce, 3,646 sacks of Douglas fir, and 353 sacks of Western hemlock. The above yielded seed on extraction as follows: Sitka spruce, 8,125 pounds; Douglas fir, 4,500 pounds; and Western hemlock, 440 pounds. Excess yields over estimates due to improvements developed in the operation of the extraction plant, produced a considerable surplus of seed over the British Government's requirements. Arrangements for the disposal of this surplus are under way at the present time.

Insects.—Operations designed to control bark beetle infestation of Western yellow pine in Prospect valley, British Columbia, were continued during the spring of 1921, along the lines outlined in my annual report for the fiscal year 1920-21. The 1921 operations resulted in the cutting and burning of over 1,300 trees, scaling approximately 500,000 feet board measure. From present indications it is figured that one more year's work, during the spring of 1922, will finally control this outbreak.

RECREATIONAL USES OF FOREST RESERVES

The popularity of forest reserve summer resorts at Trout lake and Paul lake increased tremendously during 1921. Visitors were registered from the United Kingdom, from the Hawaiian islands, from South America, and from most of the states of the United States and provinces of Canada. Fishing conditions at Paul lake were better than for several years past, but Trout lake continued rather poor. Steps were taken by this service in co-operation with the fisheries office for this district to restock Trout lake. During the season 30,000 fry of Kamloops trout were obtained from Paul creek and placed in Trout lake. Sixty thousand fry were transferred also from Paul creek to Paul lake.

During 1921 a record system was installed whereby fishermen registered their catches in Trout and Paul lakes. The records show that 717 fish, totalling 1,271 pounds, were taken from Trout lake, and 4,769 fish, totalling 11,444 pounds, from Paul lake. These figures indicate the extent to which this sport is being pursued in this district.

EQUIPMENT

Motor transport facilities were increased by two trucks and one delivery wagon. A truck was purchased also for use in the Coast district. Seven additional portable gasolene fire-pumps, purchased at the beginning of the year, brought the total available for the 1921 fire season to nine. These two mechanical aids to fire protection gave greatly increased efficiency and, to their use is due, to a considerable extent, the more favourable results secured in fire-control work during the 1921 season.

The Sicamous warehouse mentioned above in this report is located at the centre of the area of greatest fire-hazard in the Railway Belt. In the warehouse was kept a reserve of fire-fighting equipment of all kinds including specially devised emergency tool-chests and mess-kits ready for shipment to any point at a minute's notice. These pre-arranged facilities had also a tremendous effect in improving fire suppression and control operations.

APPENDIX No. 6

REPORT OF THE SUPERINTENDENT OF THE FOREST PRODUCTS LABORATORIES OF CANADA, W. KYNOCH

Although the reorganization of the staff was not quite complete at the end of the period, in many respects the year 1921-22 may be justly regarded as a very successful one. Requests for technical information and service dealt with far exceeded in number those received in any previous year and outnumbered those of the preceding fiscal year by more than two hundred. The paper-mill (of semi-commercial size) operated, on research and demonstration work, to a greater extent than in any year since its installation. The number of visitors to the laboratories was greater than in 1920-21 by nearly one hundred. Several entirely new and valuable features were introduced. With a view to wider and more rapid dissemination of technical information resulting from our researches, a publicity service was established, items of general interest being distributed weekly to the leading Canadian newspapers and technical and trade journals, as well as to some of those abroad. Frequent use of these items was made. The Technical Service series was inaugurated. This is a series of circu-

lars announcing certain services which the laboratories are in a position to give (such as the analysis of pulps and papers, the identification of woods, etc.). The circulars were widely distributed to industries and persons likely to be interested. The many requests for service received as a result indicate that the technical services are a useful facility to the industries. Finally the research and investigative work was considerably greater in amount and variety than that carried out for some years and compared very favourably with that conducted at the laboratories in any year since their inception.

A brief review of the activities of the various divisions is given below.

Division of Pulp and Paper

Three major investigations were carried on by this division during the year. In addition the division gave invaluable co-operation in a fourth major investigation conducted by the Division of Timber Physics. Brief particulars regarding each of these researches and the progress made follow.

Comparison of Rate of Growth and Chemical Composition of Canadian Pulpwoods.—The object is to determine the effect of the rate of growth upon the chemical composition of pulpwoods with special reference to the percentage of cellulose present. Extensive preliminary work, which consisted of the development of special methods of analysis, was completed.

Determination of the Burning Temperature of Exposed Chips in Sulphite Cooking.—The object is to determine the maximum temperature to which a digester charge of spruce, jack pine, or balsam fir chips may be raised, before the charge is completely covered with acid, without injury to the chips. The actual temperatures for spruce and jack pine were determined.

Pulping Qualities of Fire-killed Wood.- The object is to determine the effect of fire-killing, superficial charring, and subsequent fungal attack upon the pulping qualities of spruce, jack pine, and balsam fir. The work on spruce, both green and fire-killed, was completed. Work on all these investigations will be continued.

Water Storage of Ground-wood Pulp.—The object of that portion of the project undertaken by the division is to determine the quality of the pulp after having been stored in water under various conditions for a year and a half. The work was completed so far as the quantity of material available was concerned. Results were such as to justify semi-commercial trials of water storage which will be made during the following year. (See also under Division of Timber Physics.)

A considerable number of minor investigations was conducted including research on hemp hurds as a paper-making material, determination of the maximum strength that can be developed in paper made from kraft pulp, work on the standardization of methods of testing pulps for strength, utilization of ground-wood screenings, etc. Other minor investigations unrelated to pulp and paper but necessitated by demands made upon the Laboratories were also carried out by the chemists of the division. These included the development of an efficient method of bleaching eel grass without destroying its natural resiliency, and further work on the chemical properties of certain woods for separators in storage batteries.

DIVISION OF TIMBER PHYSICS

Three major projects were conducted by this division. Particulars follow:—

Wood Sections.—The object of this work, which was continued from last year, is the building up of a collection of authentic microscope slides of the important commercial timbers of the world. Such a collection would be invaluable for research

purposes, as an intimate knowledge of the minute structure of woods is the key to innumerable problems encountered in their industrial use. Considerable progress was made during the year, some 1,400 permanent slides being prepared, together with a large number of photomicrographs of woods and fibres. Practically all the Canadian woods of commercial importance have now been dealt with.

Water Storage of Ground-wood Pulp.—The object of this investigation is to determine whether the decay which frequently occurs in stored pulp, and is a cause of serious monetary loss, can be prevented by storage in water, and, if so, whether the pulp thus stored is otherwise adversely affected for paper manufacture. Ground-wood pulp was stored in water under certain conditions and at the end of a year and a half was found to be entirely free from attack by moulds and wood-destroying organisms.

Decay of Timber in Buildings.—The object of this investigation, which has been in progress for some years, is to secure exact and detailed information as to the conditions which facilitate the action of various wood-destroying fungi on woods used for interior construction in mills, factories, etc., and to work out procedure and methods by means of which the decay can be prevented. The monetary losses which result from such decay, particularly in large manufacturing buildings, are very much greater than is usually supposed. At the same time wood, apart from decay, is an eminently suitable material for mill construction. Expert technical knowledge on this subject has been acquired at the Laboratories as a result of careful decay studies in some 300 large buildings and, if made use of in time, makes possible the prevention of such decay. During the year further publicity was given to various special phases of the decay problem by means of periodical articles and addresses. The preparation of a bulletin on the control of decay in buildings was practically completed by the Pathologist.

A number of minor investigations was conducted by the division, including work on the bending of woods, particularly for the manufacture of certain sporting goods, and studies of pulp attacked by moulds and fungi, submitted by manufacturers, with a view to devising control measures. A special feature was an extensive study of the theory of kiln-drying, supplemented by practical studies at commercial plants. This was undertaken as a preliminary to the carrying out of research and demonstration work in this important subject at the Laboratories. A considerable number of wood identifications was made in response to requests from firms and individuals. Extensive photomicrographic work was carried out under the direction of this division.

DIVISION OF TIMBER TESTS

Three major investigations were conducted by this division during the year. Particulars follow:—

Mechanical and Physical Properties of Woods Grown in Canada.—The object of the work is to produce authoritative and complete data regarding the strength, specific gravity, shrinkage, etc., of Canadian woods of both actual and possible commercial importance. The obtaining of reliable data covering different conditions of growth, etc., involves the making of a large number of tests on each species of timber. Over 8,000 tests were made during the year, while at the Vancouver branch laboratory nearly 4,000 were made. This number considerably exceeds that of any previous year since testing was begun. Sixteen species were tested.

Glued Joints.—The object of this investigation is the determination of the strength and permanency of joints made with various glues and wood species with reference to the glue, treatment, and age. Material of a large number of different

glues was collected and testing was begun on the hide glues. The work will continue during the ensuing year and attention will be concentrated on determining the efficiency of a number of commercial glues for joint work using the chief woods employed in cabinet and furniture manufacture.

Nail-holding Characteristics of Woods.—The object in this case is to investigate the properties of woods in relation to the driving and pulling of nails under various conditions of seasoning. A considerable amount of testing with specially designed equipment was done during the year, different types of nails and the green material of eleven different species of wood being used. The work will be continued.

In addition to the above a synopsis of the results obtained in a project completed in a previous year, namely, "Nova Scotia Mine Timbers," was completed and copies forwarded to the mine operators interested.

A variety of minor investigations was also carried out by this division. These included work on the strength of aeroplane members with special reference to the question of deterioration with age and use, strength of paper cores of different designs, strength of joists, further tests on fibre-board, etc.

DIVISION OF WOOD PRESERVATION

The various major investigations under way in this division during the year all dealt with the preservative treatment of railway ties, work being conducted on two woods, namely, hard maple and aspen. Particulars are as follow:—

Adaptability of Hard Maple Cross-ties to Creosote Treatment.—The object of the work is (*a*) to determine the rate of seasoning of hard maple ties and to ascertain the length of seasoning period necessary to bring them to "treatable condition" and (*b*) to determine the influence of the various factors of treatment on absorption and penetration of creosote oil in hard maple and to ascertain the conditions of treatment which give the most satisfactory results. The seasoning study (*a*) was completed. Extensive work was done on (*b*) a number of charges of test pieces being treated and results analyzed by special methods developed at the Laboratories. A satisfactory treatment had not been worked out at the close of the year and the investigation will be continued.

Adaptability of Aspen Cross-ties to Creosote Treatment.—The objects of the investigation are the same as in the case of hard maple. Large quantities of aspen occur in certain parts of Canada, and in portions of Alberta much aspen is found contiguous to railway lines. Little if any use is made of this timber. If it can be satisfactorily creosoted, however, and its natural perishability thus overcome, it should become of considerable value as a tie material. A number of aspen logs shipped to the Laboratories from Alberta by the Canadian Pacific Railway were sawn into No. 1 half-ties and standard test pieces. A seasoning study on the half-ties was begun, determinations of rate of seasoning being made periodically. The test pieces were piled for seasoning and work on treatment will be begun as soon as they are sufficiently seasoned.

The other work of the division included a number of minor investigations. Work was done on the development of a suitable fire-retardant treatment for wood. Such a treatment would be of the greatest value for interior woodwork in buildings and elsewhere. Existing processes appear either too expensive or subject to other serious objections. Material progress had been made by the close of the year. The chemistry of wood preservatives received a good deal of attention. Proprietary preservatives to a considerable number were carefully analyzed and tested by special method in order to compare them with good grades of creosote oil. Samples of tars, tar-creosote mixtures, and creosotes submitted to the Laboratories for examination

as to suitability for use in preservative treatment of ties or other timber were analysed, tested, and reported upon and recommendations as to specifications made. Many samples of treated wood were also submitted for examination as to efficiency of treatment, etc., and recommendations and suggestions made for improvement in procedure in many cases. Treatment of telephone pole brackets received special attention.

EXHIBITS

The collection and preparation of exhibits of forest products and articles manufactured therefrom was continued and a number of additions made to the permanent collection at the Laboratories. Such work included the making of cabinets to contain such additions. Exhibits were prepared also for the use of other Government offices and for display in public places. In September the Department of the Interior occupied space at the Seventh National Exposition of Chemical Industries at New York and an exhibit was prepared at the Laboratories to illustrate some of the possibilities of Canada as a field for chemical industries requiring electrical power or products of the forest. Large wall maps showing the distribution of water-power and of the pulp and wood-distillation industries in Canada were displayed and a variety of products was shown in a manner which attracted considerable attention to Canadian resources.

The demand for hand-specimens of Canadian woods continued during the year and necessitated the making of a fresh supply.

The work of collecting various products which are not subjects of research by other divisions (e.g. lumber by-products, resins, gums, extracts, distillates) has enabled the Exhibit Specialist to undertake the task of replying to inquiries concerning such products and their manufacture. Work on exhibits is, in fact, so closely allied to the publication of information that it has included the preparation for the newspapers of items of technical information and announcements of technical service already referred to as having been instituted during the year under review.

LIBRARY

The library of references, which deals with the technology of forest products, the manufactures therefrom, and related matters, was considerably enlarged and improved. Literature bearing on every phase of the subjects mentioned has been collected for the past eight years and the reference library thus accumulated has proved invaluable to the technical staff in their research and other work.

INFORMATION FURNISHED

The furnishing of technical information in response to inquiries relating to timber, forest products, and derived products is a most important function of the Laboratories. This work involves a careful study of the available data on the subject in question and, in some cases, tests or investigations, the final step being the compilation of a report which is forwarded to the inquirer. Inquiries numbering 427 received attention during the year—a considerably greater number than in any previous year since the establishment of the Laboratories. The growing demand, on the part of the wood-using industries, for the services of the Laboratories is clearly indicated by the continually increasing number of technical inquiries received. A feature worthy of mention also is the expressions of appreciation of the assistance given which are frequently received.

GENERAL.

A number of technical articles was prepared during the year by members of the staff and published in Canadian and other periodicals. An exhaustive bulletin dealing with hardwood distillation in Canada was a special feature. This is expected to appear early in 1922-23. Several lectures and addresses were also delivered before scientific, technical, and other societies.

The research and other work of the Laboratories involves a considerable amount of special photographic and photomicrographic work and a high standard in this connection has been reached. Worthy of mention is a series of photomicrographs of wood structure, fibres, etc., prepared by request for Volume 3 of "The Manufacture of Pulp and Paper" a standard textbook issued by the pulp and paper industry of the United States and Canada.

It is noteworthy that increasing activity in forest products research is to be seen in several countries in which the forest resources and the wood-using industries are much less important commercially than with us. In Canada these industries are, in the aggregate, second in importance only to the agricultural industries and the economic possibilities of research in this field are each year becoming more clearly evident.

PART IV

RECLAMATION

REPORT OF THE DIRECTOR OF THE RECLAMATION SERVICE, E. F. DRAKE

The unusual climatic conditions to which the semi-arid districts of southern Alberta and Saskatchewan have been subject during the last few years have led to a great demand for surveys to determine what areas it is possible to serve with water, and the work of the Reclamation Service, whose duty it is to make these investigations and surveys, has increased tremendously. The year 1921 brought more demands for advice and practical assistance than any previous year.

CLIMATIC AND CROP CONDITIONS FOR 1921 IN SOUTHERN ALBERTA

Statistics show that the five years just ended constitute the longest consecutive period of sub-normal rainfall for many years, and some increase in precipitation may therefore be reasonably expected for the next few years, as periods of drought and abundant rainfall usually occur in cycles.

From December 1, 1920, to the end of March, 1921, the weather was mild with practically no snowfall. This condition was excellent for stock and very little feeding was necessary. Good weather was experienced in April, when light rains occurred, seeding being practically finished by the middle of the month. May was very warm but the rainfall was scanty and there was no reserve moisture in the soil. The month of June was extremely dry, crops being seriously damaged through lack of rain and by hot, dry winds. In July the rainfall was normal, but came too late to save the crops.

IRRIGATED CROPS

Because of light rains during April, which created a good seed bed for the crops, many farmers delayed their irrigating in spite of repeated warnings from the press and irrigation officials, and when the dry, hot weather came in June, the crops on irrigated lands suffered before water could be applied. In spite of this setback, which reduced the yield considerably, the irrigated crops were fair and averaged approximately three times the yield of those on dry land in the same areas. More acreage was irrigated in 1921 by a larger number of farmers than in any previous year. The large amount of surplus fodder grown on these lands did much to compensate for the shortage on the adjacent dry lands.

PROGRESS IN IRRIGATION DEVELOPMENT

Corporation Projects.—Development of the large corporation projects has been seriously retarded by the war and the conditions which have existed since. With the return of better times, and a fuller realization on the part of the people of the

benefits of irrigation, all indications point to an influx of settlers and the rapid colonization of the available irrigable lands in these projects. The farmers now settled on these lands are every year showing a greater tendency to abandon the system of agriculture to which they have been accustomed and to adapt themselves to the diversified crop system and intensive farming necessary under irrigation. A large amount of renewal and betterment work has been done during the year and the canal systems of all the projects are reported as being in excellent condition.

Irrigation Districts.—It is probable that corporate irrigation development will be carried on in the future entirely by the district form of organization. The province of Alberta now has an up-to-date and effective Irrigation Districts Act, and a great deal has already been accomplished under its provisions. An Irrigation Council appointed by the province is exercising close supervision over the organization and construction of a number of districts and the machinery provided seems to be running smoothly.

Several districts were organized under this law in 1920, but the first of these to complete its preliminary organization found no market for its irrigation debentures, which were a new commodity in the Canadian financial market. It appeared for a time that further development work by districts must for this reason be indefinitely deferred, but the Provincial Government came to the rescue and by an amendment to the Irrigation Districts Act, passed at its 1921 session, made arrangements to guarantee the bonds of irrigation districts which were favourably reported upon by consulting engineers. This guarantee proved effective and the bonds of this district, as well as those of another organized later, found a ready sale at a fair price and construction work was begun.

These preliminary difficulties having been successfully overcome development work was started. It then became evident to those who were closely studying the problem that many of the individual holdings in the districts were too large to be properly cultivated under irrigation conditions, owing chiefly to the high cost of the works, the inexperience of most of the settlers, and the difficulty of securing a sufficient and dependable supply of skilled irrigators. In order to achieve success in irrigation farming when the cost of the works is fairly high, every acre must be carefully cultivated and made to yield good returns. Generally speaking, the average farm unit should contain from 80 to 160 acres of irrigable land, while the holdings usual in dry farming in this country—and common in the newly organized irrigation districts—run from 320 to 640 acres, or even more. The provincial authorities, foreseeing the difficulties farmers would encounter in redeeming their bonds under such conditions, decided that the larger holdings should be split up, and in 1921 a colonization branch was organized under the control of the Irrigation Council of Alberta. This branch will list the excess land holdings that should be disposed of by the farmers and will carry on a colonization campaign for the purpose of selling these lands and placing additional settlers on them. The practical effect of this effort will be watched with great interest.

Since the Irrigation Districts Act was passed seven districts containing 206,000 acres of irrigable land have been organized; six more containing 35,000 irrigable acres are nearly ready for organization, while five additional projects containing a total of 552,000 irrigable acres are in various stages of preliminary organization.

In Saskatchewan many small irrigation schemes are being operated, but no large co-operative projects have yet been developed. An Irrigation Districts Act very similar to that of Alberta was passed in 1920, but has not yet been used. One project has, however, been surveyed and an irrigation district is now being organized. The Act will therefore probably be brought into practical operation at an early date.

Small Irrigation Projects.—The construction of small individual projects is interesting many farmers whose lands can be irrigated by direct diversion from

nearby streams in the semi-arid areas and the waters of some of these streams have been practically all appropriated. Some of these small projects have been operated successfully for many years and there are at present 483 licensed or authorized schemes, while applications for 228 new schemes were recorded in 1921, making a total of 711 small projects in operation or under construction under the supervision of the Reclamation Service.

Water Users' Associations.—When the development of any large irrigation project or district is completed, the simplest and most satisfactory method of operation and maintenance will probably be by the formation of a number of water users' associations, each consisting of the water users under one or more of the lateral ditches of the project. These local associations, by operating their own systems, can more satisfactorily serve their own requirements and greatly simplify the administration of the whole project. Owing to lack of complete settlement, the time has not yet arrived when these associations are really necessary, but four of them have been formed in the Lethbridge section of the Canadian Pacific Railway Company's projects and are already proving their value.

Irrigation Development Association.—This organization, with headquarters at Lethbridge, was formed some years ago for the purpose of furthering the use of water, aiding in the organization of irrigation districts, and maintaining connections between the farmers and the Dominion and Provincial Governments. The association is still taking an active interest in irrigation development and during 1921 its executive committee presented the case of the farmers of southern Alberta before the International Joint Commission at its hearing in Lethbridge in September.

IRRIGATION IN 1921

During the year 220,000 acres were irrigated in the five large projects now in operation, a satisfactory feature of the season's operations being the large amount of fall irrigation carried on. Construction work was started during the year and is being actively prosecuted on two more large projects, the Lethbridge Northern irrigation district with 105,000 and the United irrigation district with 23,000 irrigable acres. In the United district (south of the town of Macleod) a large proportion of the excavation work and hauling of material is being done by the farmers themselves in small contracts. This lends itself to cheap construction and provides work for men who have no crops of their own to harvest, besides keeping a considerable part of the outlay for construction in the district.

The preliminary surveys for practically all projects—large or small—were made by the Reclamation Service in pursuance of the policy of the Federal Government that the surface water it controls shall be so allocated as to serve the public to the best advantage. In addition to the constructed schemes, surveys have been completed for thirteen other projects which have been found feasible and are now in different stages of organization. Surveys are now being carried on in six new projects and preliminary surveys were also made of several projects which were not found to be feasible or economical and were therefore abandoned.

DUTIES OF THE RECLAMATION SERVICE

It is the duty of the Irrigation Division of the Reclamation Service to administer the surface water supply (with the exception of water powers) in the Prairie Provinces. This is done under the provisions of the Irrigation Act and includes the use of water for domestic, municipal, industrial, irrigation, and other purposes. To administer the water supply so that the greatest benefit may result to the public is a heavy responsibility, and a large staff of engineers and helpers is needed to deal

with the many different phases of the work. Because of the ever-increasing demands for irrigation the work has been growing heavier each year and the present year has been no exception. The work comprises:—

1 Inspections and surveys of small schemes, new or in operation;
2 Supervision of large projects under construction or in operation;
3 Duty of water experiments and climatic studies;
4 Soil surveys and experiments and seepage investigations;
5 Plane table and final surveys to complete some projects, and location, topographical, and reconnaissance surveys in connection with new projects and the development of reservoir sites.

These surveys and investigations of various kinds were carried on at a number of different points throughout southern and central Alberta and southwestern Saskatchewan. Good progress was made during the season which ended in November, 1921, and during the winter months the engineers and some of the more skilled assistants were employed in the office preparing plans of work done in the field and making the necessary designs, studies, and cost estimates of the different projects. The following schedule shows the development of irrigation up to this date:—

IRRIGATION DEVELOPMENT IN WESTERN CANADA

Project	Source of supply	Area of tract	Irrigable area	1921 Operations		Cost of construction up to 1921	Mileage of Canals
				No. of water users	Area irrigated		
		acres	acres		acres		
Constructed and in operation -							
C.P.R. West'n sec.	Bow riv.	1,145,336	218,980	875	33,618	$5,116,252 00	1,469
C.P.R. East'n sec.	Bow riv	1,212,074	400,000	924	88,299	10,924,738 00	2,500
Alberta Ry. & Irr. Co.	St. Mary riv.	434,509	130,000	865	75,550	1,874,601 00	200
Taber irrigation district	St. Mary riv.	30,365	17,244	160	10,352	272,000 00	72
Under construction, partly in operation—							
Canada Land & Irr. Co.	Bow riv.	452,482	202,640	64	9,400	6,473,207 00	355
Under construction, not in operation—						Estimated cost	
Lethbridge N. irr. dist.	Oldman riv.	231,220	105,000			5,400,000 00	
United irr. dist.	Belly riv.	61,195	23,000			524,000 00	
Found by surveys to be feasible and economical (dist. organized)							
Macleod irr. dist.	Waterton riv.	108,603	49,649			2,060,000 00	
Medicine Hat E. irr. dist.	Ross crk.	4,800	2,900			36,140 00	
Little Bow irr. dist.	Highwood riv.	11,490	3,278			74,250 00	
Found by surveys to be feasible (dist. not organized)—							
Eyremore irr. dist.	Bow riv.	18,776	4,100			250,000 00	
River Bow irr. dist.	"	16,688	5,792			314,357 00	
New West irr. dist.	"	13,015	7,629			385,000 00	
Lethbridge S.E. irr. proj.	Waterton, Belly, St. Mary, Milk rivs.	1,182,781	390,708			15,800,000 00	
Robsart-Vidora proj	Frenchman riv. and Belanger, Davis, Sucker and Fairwell crks	14,000	10,000			343,841 00	
Incompletely surveyed, believed feasible—							
Retlaw-Lomond irr. dist.	Bow and Oldman rivs.	418,630	70,000			2,500,000 00	
Champion irr. dist.	Highwood riv.	184,860	50,000				
Granum irr. dist.	Willow crk.		4,500			260,000 00	
Beaver Crk. proj.	Beaver crk.		9,000			450,000 00	
Surveys commenced—							
N. Saskatchewan irr. proj	N. Sask., Clearwater, Red Deer and Battle rivs.	3,538,760	1,778,784 (estimated)				
Private schemes (483)—							
Small private schemes			105,397				
Prospective development—							
Co-operative			250,000				
Small private schemes			85,000				
Total			3,923,601				

The "St. Mary and Milk River Case", dealt with under the provisions of the Waterways Treaty, and to which reference has frequently been made in earlier reports, has apparently now been finally settled; at all events, it has advanced another stage toward final settlement.

Provision is made in article VI of the Waterways Treaty between Great Britain and the United States for the division of the waters of the St. Mary and Milk rivers, and their tributaries in the state of Montana and in the provinces of Alberta and Saskatchewan, between Canada and the United States in such manner as to recognize to some extent the prior appropriations from these streams in the respective countries, and to ensure approximately equal division of the waters, it being stipulated, however, that more water may be taken by one country from one stream and less from another, without, however, affecting the substantially equal division of the total flow. The case was first considered officially by the International Joint Commission at a public hearing at St. Paul, Minnesota, in May, 1915, at which all the interested parties were represented and considerable evidence was taken. This was followed by arguments by counsel, and later by the filing of written briefs. Again, in May, 1917, a further hearing was held at Detroit, Michigan, where additional arguments were submitted by counsel and, still later, final arguments were heard at a meeting of the Commission held in Ottawa in May, 1920.

In the meantime, and pending the issuance of a definite order, it became necessary to provide for some method of dividing the waters of these streams so that irrigation development might proceed without serious hindrance. Therefore, on May 24, 1918, the commission issued an interim order describing in considerable detail the methods to be followed by the designated representatives of the United States and Canada, respectively, in measuring and apportioning the waters of these streams and their tributaries during the irrigation season of that year. This order was found to be satisfactory as a temporary expedient. It was therefore renewed by the commission on April 3, 1919, April 7, 1920, and April 6, 1921, in substantially the same terms.

Under these interim orders the Reclamation officers of Canada and the United States continued their measurements of stream flow and apportioned the waters as was found necessary from time to time. No serious difficulties were encountered, but it soon became apparent that no considerable development of irrigation would be possible in either country until the commission made some final order defining the proportion of stream flow that would be permanently assigned to each country. This was particularly the case in southern Alberta, where surveys carried on by the Canadian Reclamation Service had demonstrated the feasibility of irrigating a considerable additional area of land by the utilization of all the available stream flow and the conservation of flood flow wherever possible. It was felt that the actual construction of works of any magnitude would be inadvisable pending a final decision by the commission.

In September, 1921, the commission held further hearings at Chinook, Montana, and at Lethbridge, Alberta, for the purpose, primarily, of giving the locally interested persons an opportunity of presenting their views directly to the commission and to place the commission in possession of any facts which might not have been clearly brought out at any of the earler hearings or by any of the arguments submitted by counsel.

Following these hearings the commission at its next regular meeting at Ottawa on October 4, 1921, gave an order which for all practical purposes may be regarded as an interpretation of certain alleged ambiguities in article 6 of the treaty, and as a final order apportioning the flow of these streams between the United States and Canada, respectively.

On October 6, 1921, the commission made a further order or recommendation addressed to the Governments of the United States and Canada jointly. Realizing that the control of flood water is the crux of the situation, in so far as irrigation development in southern Alberta, southwestern Saskatchewan, and northern Montana is concerned—in so far as this development is dependent upon the waters of the St. Mary and Milk rivers and their tributaries—the commission recommended that the United States and Canada should jointly construct a reservoir for the control of flood waters at St. Mary lakes, in the state of Montana; that the United States should construct the Chain of Lakes reservoir in the Milk River valley below the point where Milk river crosses the international boundary for the last time—this for the more effective control of the flood waters of that stream; and that Canada should construct a reservoir in Verdigris coulee in southeastern Alberta, where it is possible to conserve waters diverted either from the St. Mary or the Milk river. The commission further recommended that these reservoirs, when constructed, should be maintained and operated under its control so as to ensure the most beneficial use possible of the waters.

No action has as yet been taken by either Government to carry these recommendations of the commission into practical effect. It will probably be necessary, before any definite action is taken, to have an investigation made by the engineers of the respective countries, either severally or conjointly, to determine the feasibility, the practical effect, and the cost of carrying the recommendations of the commission into effect. The recommendations are believed to be entirely practicable from an engineering point of view. The questions to be studied have, therefore, largely to do with the size of the several reservoirs, their approximate cost, the manner in which that cost shall be shared—in so far as international co-operation has been recommended—and the manner in which the stored water shall be apportioned to the two countries, respectively.

DRAINAGE

The investigation of reclamation projects during the 1920-21 season by the engineers of the Drainage Division of the Reclamation Service has resulted in the addition of three more projects initiated by the Government to the eleven previously investigated and recommended as feasible and in the public interest, making a total area of approximately 220,000 acres of swamp and submerged lands that can be economically drained and made available for settlement. While the reclamation of this area would provide accommodation for no less than two thousand families, there would be a further and far-reaching benefit in the greater consolidation of the present scattered and uneconomic form of settlement in the vicinity of the projects, in making possible the construction of roads to reach many good farming districts at present unapproachable, thus forming the nuclei of extensive farming communities. The cost of the reclamation works, according to estimates of the engineers, would be more than reimbursed by the sale of the Crown lands and the assessments on the privately owned lands benefited.

These recommended reclamation projects embrace principally such lands as experiment and experience have shown to be the most readily available for agriculture and the growing of hay. Lands requiring considerable expense in clearing of timber, moss, and reeds have been avoided for the present in favour of those more nearly ready for the plough or the growing of hay, except in cases where such clearing is only required on a small proportion of the project.

In addition to the investigation of the above projects, which have been recommended for construction by the Federal Government, surveys of the extensive swamp lands known as the Carrot River Triangle were commenced in the spring of 1921 and carried on vigorously until far into the winter. This tract lies between the Saskatchewan and Carrot rivers in Saskatchewan and Manitoba and has an area

approximating 1,100 square miles. It lies in the direct route of the proposed railway running from Melfort in Saskatchewan to Pas in Manitoba, which when built would connect the grain belts of Saskatchewan and Alberta with the Hudson Bay railway and Port Nelson. Should this project prove feasible, its reclamation would ensure revenue for the railway and the railway would provide the needed transportation facilities for the farming community. Another season's work is required to complete the surveys and investigations, which on account of the difficulty of penetrating the swamps during the open season will probably be again carried on through part of the winter.

Three other projects, initiated by the Federal Government under part 4 of the Drainage Regulations, were investigated but not recommended for reclamation on account of the high cost of construction, the prevalence of deep moss muskegs, the poverty of the soil, or on account of their containing upwards of fifty per cent of privately owned lands and thus coming under the provisions of part 3 of the Drainage Regulations which contemplate the initiation of the work upon petition of the landowners under provincial laws.

Many applications for private drainage schemes under part 1 of the Regulations were received, but when it became known that the minimum price of Crown lands had been increased from one dollar to five dollars per acre, while the area that might be sold to any one applicant was reduced from 1,280 to 320 acres, many withdrew their applications and others who allowed their applications to stand did so under protest. Twenty-five new applications of this class were dealt with and twenty-six inspections were made of those already under way.

The construction of the Waterhen Lake drainage project, initiated by the Government, was commenced in May and the work of excavation was continued throughout the season until the freeze-up in November. Approximately seventy per cent of the excavation was completed. The water of the lake will be let off about midsummer of 1922 and as soon as the lake bed and the marsh dry sufficiently to permit the construction of the bridges, culverts, and small laterals this work will be proceeded with, but it is expected that some of the minor details will not be completed in 1922.

Difficult problems are being encountered in many projects regarding the treatment of various classes of swamp lands after the water has been drained off. Various methods of clearing the land of superfluous accumulations of undecomposed vegetable matter and supplanting coarse wild grasses of low food value by the more valuable cultivated grasses are being adopted by owners of private drainage schemes. While these methods and the results are being carefully noted, it is obviously of the utmost importance and in the public interest that practical experiments should be carried out by the department along scientific lines. The application of artificial and barnyard manures on an extensive scale is quite out of the question in newly settled districts and lands requiring such treatment for their reclamation are for the present being passed over, but experiments of the kind recommended may indicate other practical methods of treatment.

Profitable cultivation of the dry belt in the southern parts of the Prairie Provinces is dependent upon irrigation, and although only a small percentage of the area can be irrigated these favoured areas can be made to produce marvellous crops and to pay a good return on the capital invested. There will, however, always be extensive tracts of unreclaimed land in the dry belt because of scanty water supply and the unsuitability of some land for irrigation. The northern parts, on the other hand, enjoying a greater amount of rainfall, will contain only a comparatively small percentage of uncultivable lands after the swamp lands have been drained and the timbered areas cleared. While the actually irrigated lands of the south may be more intensively productive, profitable farming lands will be more widespread and general throughout the north, following in the wake of drainage.

Report of the Acting Commissioner of Irrigation and Chief Engineer, V. Meek, A.M.E.I.C.

This report is a summary of the work accomplished during the year. A more complete account will be found in the original reports of the several engineers which are on file in the offices of the Reclamation Service at Calgary and Ottawa.

WATER ADMINISTRATION

During the year a considerable portion of southern Alberta again suffered from drought, making the fifth year in succession with less than normal rainfall. As a consequence there has been an increasing demand for irrigation and for the construction of works to serve large tracts of land on which dry farming methods have not proved successful. A total of 228 applications for water rights was filed, which is greatly in excess of the record for any previous year. In 1915 as water supply conditions on many streams were reaching a critical stage, steps were taken to revise existing water rights according to a new standard which has been applied to all applications since received. The wisdom of these steps has been fully demonstrated.

Duty of Water.—Formerly it was the custom in granting water rights to allow the full legal duty of eighteen inches, but now many of the grants are made according to the estimate of the quantity which can be applied to beneficial use. Three classes of rights have been established, viz.: those based on depths of eighteen inches (the legal duty), twelve inches, and eight inches respectively. Unless climatic, soil, or storage considerations are such as to make a change advisable, it is usual to allow the full legal duty when water is normally available at all stages of a stream, twelve inches when high and flood waters are available and eight inches for flood rights.

Climatic studies involve the collection of data over a long period of years relating to precipitation for the year, the growing season and each month, as well as information regarding temperatures which are especially valuable as indicating the period during which water can be applied with most beneficial results. These investigations have been greatly facilitated by the publication of a report entitled "The Temperature and Precipitation of Alberta", by A. J. Connor, M.A. (Climatologist), under the direction of Sir Frederic Stupart, Director of the Meteorological Service, Toronto.

Questions relating to texture and composition of the soil must also be carefully considered in determining the duty of water for any project. A soil containing a high percentage of pore space, such as sand, needs more water than a clay soil, but it must be available over a longer period since the application of a large quantity of water at one time to a sandy soil would only result in the rapid percolation of the greater part of it to depths beyond the reach of plant roots. In the heavier clay soils the application of water in large quantities has the tendency of causing alkali to rise and become concentrated at the surface in quantities sufficient to cause injury to growing plants. Where soils of this character are met with, samples are analysed and upon the result of these analyses depends largely the quantity of water that is granted.

Revision of Water Rights.—Many of the older licensed schemes are not using the full quantity of water to which they are entitled. The operation of these schemes is being closely observed each year, so that when water becomes scarce on any stream appropriate steps may be taken to reduce the old grants to conform to the use that is being made of them. Such steps will be taken under the provisions of section 46 of the Irrigation Act.

Experiments at the Brooks Duty of Water Station have proved conclusively that fertile soils will produce their best crops with considerably less water than is

required to produce maximum yields on soils of lower fertility. It is not practicable in most cases in the present stage of irrigation development in Western Canada to take this factor into consideration in determining the duty of water that is to be granted, but irrigators are being urged to study carefully the water requirements of their particular soils so that the best results may be obtained. The tendency in Canada as everywhere that irrigation is practised, is to apply water greatly in excess of the requirements of crops.

Treaty Waters.—Irrigation development which depends upon the use of the St. Mary and Milk rivers and their tributaries has been retarded for a number of years owing to a dispute as to the method of apportioning the waters of these streams between Canada and the United States. The uncertainty regarding this was removed by an order of the International Joint Commission issued on October 4, 1921. This order will, no doubt, result in considerable immediate development of irrigation in both countries.

INSPECTION WORK

Owing to the large increase in the number of applications for water rights, the amount of inspection work required has greatly increased during the past few years. Five engineers are now employed on this work, which covers domestic, municipal, industrial, and irrigation schemes. Inspections of proposed irrigation projects involve the making of surveys and the preparation of plans, which occupies a considerable portion of the time of the inspecting engineers. In one or two districts this year it was found impossible to keep abreast of the new applications and at the same time to make inspections of schemes already in operation. Preference was therefore given to the new applications and for the time being some of the older schemes were neglected. However, by a rearrangement of the work next season it is hoped to provide for the inspection of all schemes. The annual inspection of operating schemes is to the mutual advantage of both the department and the irrigators, the irrigators receiving the benefit of the engineer's advice and co-operation, and the engineers adding to their fund of irrigation engineering and farming knowledge and thus becoming better qualified to judge of the relative value of the various methods of construction and operation.

On many streams all the low water and in some cases all of the high water has been fully appropriated, although the records may show a considerable amount still available during the short period of flood flow. New applications on streams where these conditions obtain are often difficult to deal with as prior licensees are apprehensive of impairment of their rights should such applications be granted. These conditions call for increasing vigilance on the part of the inspecting engineers to ensure that licensees on critical streams confine their diversion operations strictly in accordance with their grants.

Domestic Water Supplies.—The riparian right of a landowner under the existing Canadian law allows the free use of water for domestic and stock-watering purposes, but does not include the right of diversion. If water is to be diverted by means of a dam, flume, pipe, ditch, channel or other means requiring the construction of works, such diversions can only be legalized by securing authority therefor under the Irrigation Act. This also applies to the numerous small reservoirs built by settlers to impound water from the spring run-off.

The inspecting engineers therefore advise the settlers who have constructed such reservoirs to secure rights under the Irrigation Act, and also explain to them that although in most cases the existence of the reservoir may not at the moment interfere with other rights, there is always the possibility of new-comers filing applications for the right to divert and store above or below them; and that if these

applications were granted they might be entirely deprived of their usual supply of stored water and of legal right of obtaining such water in the future. An estimate of the cost of filing such memorials and plans is generally given at this time together with an outline of the precedure to be followed. In most cases the total cost does not exceed $15, i.e., $5 for license and $10 for survey and plan.

The Cypress Hills District.—Little progress was made by the settlers in the development of the smaller irrigation schemes in the eastern portion of this district during the year. The cause of inactivity is not so much lack of interest as scarcity of funds consequent upon a succession of dry years with attendant crop failures and the decrease in the prices of farm products. A party was placed in this district for the purpose of investigating the possibilities of irrigating an area of some 11,000 acres to be known as the Robsart-Vidora irrigation district. Fuller comment on this work is made elsewhere in this report.

In the western portion of this district the settlers now appear to fully realize the advantages to be obtained from irrigation and many new applications for water have been received. Several of these are for the right to divert from coulees which collect the run-off derived from melting snow. Many applications have also been received for water from streams the scanty flow of which has already been fully appropriated. This is particularly true of the southern portion of the district.

Cardston District.—Most of the irrigation projects in this district are situated in the foot-hills region, which is essentially a stock-raising country, and the bulk of the irrigable land is devoted to the growing of fodder crops. Those projects which were in good repair used water to advantage, but the full benefit of irrigation was not obtained by many irrigators, owing to delay in applying water until the season was too far advanced and the creeks had become too low to enable a full supply to be diverted. During recent years the duration of sufficient flow for irrigation has been short and it is important therefore that irrigators should make full use of their ditches early in the season, before the supply gives out.

CANADIAN PACIFIC RAILWAY COMPANY'S IRRIGATION PROJECTS

Western Section.—This section includes about 1,000,000 acres, of which approximately 218,980 are irrigable. An unusually heavy programme of maintenance and betterment was carried out during the year. A large number of structures were entirely rebuilt and a great many others were reconditioned. For the purpose of keeping the ditches cleared out the company has in use in this section six "D.N.R." excavators. These can be operated while the water is running without in any way interfering with the operation of the system. Approximately 90 per cent of the land in this section has been sold and the settlers are now mostly well established with substantial buildings and a fair amount of stock.

A rainfall of 2·18 inches during April created an excellent seed bed and the crops during May were in splendid condition and well advanced. With the prospect of the customary June rains the farmers unfortunately delayed their irrigation work in spite of warnings given through the press and by the officials of the company at Strathmore. There was practically no rainfall during June and hot, drying winds during the middle and towards the end of the month caused great havoc to a very promising crop. The result of this experience should convince the farmers of the need for preparedness and of the desirability of a judicious application of water before the crops show signs of wilting. In this particular area soil moisture tests proved the urgent need for supplementing the soil moisture content and this also was brought to the attention of the water users by the company's officials and through the press, but, with few exceptions, without avail. During the 1921 season some 33,618 acres were irrigated, or 15·3 per cent of the total irrigable area.

Eastern Section.—Settlement in the Eastern Section has been retarded owing somewhat to the generally depressed conditions, but, chiefly to the decline in yields during the past few abnormally dry years and to the drop in the price of wheat; and many farmers have applied to the company to reduce their holdings. Under existing market conditions and the high price of labour the settlers are coming to realize that they cannot operate efficiently large acreages of irrigated land. A system of smaller farms with more intensive cultivation and crop diversification is gradually being evolved. The distributory system was greatly enlarged during the year and extensive repairs to structures were made.

The area actually under irrigation was 88,299 acres as compared with 60,762 acres in 1920. Some 64,768 acres were seeded to wheat which produced 850,842 bushels as compared with 625,589 bushels produced on 37,260 acres in 1920. The low yield in the Eastern Section is attributed to deficient rainfall and also to hot, drying winds occurring in June. Water was not applied in time and the resulting conditions in many cases proved disastrous to the crops.

Lethbridge Section.—The same climatic conditions and the same negligence on the part of irrigators which proved so disastrous in the Western and Eastern Sections produced similar results in the Lethbridge Section. Crops generally were most promising until the end of May, and, in some cases, even to the end of the first week in June. But no rain in appreciable quantities fell until the middle of June and hot winds caused enormous damage everywhere. Many farmers had decided to irrigate immediately after the first hot spell, but the delay caused the crops to be badly burned, thus again proving conclusively that it is fatal to wait until crops show signs of wilting before starting to irrigate. Had the grain fields been fall irrigated, sufficient moisture would have been carried over in the soil to take care of the crop during the first heat wave and thus have given the farmers an opportunity of getting their ditches in shape and the water applied to the fields. The lesson has been a costly one to many, and in order that such a loss should not befall them in the future a great many applied for fall irrigation; in fact, some 22,500 acres of grain land were irrigated during the fall of 1921, or nearly 70 per cent of the whole area likely to be seeded to grain in the spring of 1922. These lands will now have a reserve supply of moisture sufficient to carry the crop along until water can be again applied, which should render them immune from any serious drought conditions which may occur in 1922.

The average value of the crops raised during 1920 on some 79,650 acres in this district was $19.31 per acre, whereas the results for 1921 show only $21.75 per acre over an area of 75,550 acres. The two chief reasons responsible for the great decrease in the per acre return, as compared with the previous year, are: first, the general slump in the prices of farm produce, and, second, the failure to irrigate at the proper time, the reasons for which have been outlined above. During the 1920 season, 6·03 inches of rain fell during the months of April and May, as compared with 2·15 inches during the same months of 1921, which accounts for a great deal of the depreciation in crop yield. The wheat yield, for instance, rated only $11.68 per acre as against $47.25 per acre in 1920.

TABER IRRIGATION DISTRICT

This district is served with water by an extension of the Lethbridge section of the C.P.R. irrigation system. It was the first district to be erected under the provisions of the Irrigation Districts Act of Alberta and its success so far has fully justified the expectations of its creators. The settlers are enthusiastic irrigators. Sixty-one per cent of the total irrigable area (10,352 acres) was supplied with water during this the second year of operation of the project.

In his annual report the secretary of this district has emphasized the value of fall irrigation and has recommended that the future operating policy should be to make regular deliveries of water up to the middle of October. The policy of running the system indiscriminately throughout the fall of the year is considered unsound. The heavy weed jams, which occur in this district from time to time, often displace the smaller structures and necessitate the expenditure of a considerable amount of time and work to get them back into position, and this can usually be done to best advantage in October when the ditches are not in use. The month of September, which should be devoted to fall irrigation where grain crops are grown, was, in fact, a month of low demand, only some 3,700 acre-feet being delivered, whereas during the month of October the quantity increased to some 9,300 acre-feet.

THE SOUTH SASKATCHEWAN DIVERSION PROJECT

In the Annual Reports of the department for 1919-20 and 1920-21 will be found a brief outline of the history of this project and a description of some of its salient features. On July 27, 1921, a vote was taken of the municipal electors in the cities of Regina and Moose Jaw, and the towns, villages, and rural districts along the route of the proposed pipe line, who were to benefit by the scheme.

The voting resulted as follows:—

	For	Against
Regina city	727	97
Moose Jaw city	1,184	286
Country districts including the villages	748	1,449
	2,659	1,832

From this it is apparent that the cities of Regina and Moose Jaw were, by a large majority, in favour of the project, but that the rural district vote was overwhelmingly against it, as submitted. It was necessary for the ultimate economic success of the scheme that a large percentage of the vote should be in the affirmative, in fact, it required a majority in each of the above voting units to warrant proceeding. The vote in the country unit entirely failed to give such a warrant, although the villages were in favour of the scheme and, with the exception of two municipalities, the vote in the country was very small and with small adverse majorities. Some twelve townships out of the total area voted in favour.

Since the vote was taken a number of petitions and resolutions from the villages, towns, and cities have been received and the Water Supply Commission has reported in favour of a suggestion that the two cities take the initiative and form a water district to which may be added, by petition, the villages or such of the country districts as may indicate their desire to do so, in accordance with conditions that would be satisfactory to all. This recommendation was forwarded to the cities by the Government, but on account of the present depressed financial outlook the matter is in abeyance. In spite of the unfavourable financial conditions existing at the moment, interest in the scheme has not waned and those in favour are keenly alive to the necessity of initiating the necessary proceedings along the lines which have been indicated by the commission as soon as times are propitious.

CANADA LAND AND IRRIGATION COMPANY

This company delivered water to 9,400 acres during the growing season and for fall irrigation sufficient to cover about 10 per cent of this area. Water was turned into the system on May 12 and shut off on November 1, 1921. Approximately 92,000 acre-feet were delivered from Bow river into Lake MacGregor reservoir. The avail-

able storage at the end of the irrigation season in this reservoir was 100,000 acre-feet and in the Little Bow reservoir, 13,700 acre-feet.

There was considerable agricultural development during the year in the vicinity of Vauxhall, the efforts of the new settlers in establishing themselves on the lands being attended with marked success. Regulations governing the operation and maintenance of the project were drawn up and have now been approved.

LETHBRIDGE NORTHERN IRRIGATION DISTRICT

All survey and construction work in this district was conducted by the trustees of the district under the general supervision of the Provincial Irrigation Council. The main and branch canals were located in 1920 and the spring of 1921. For purposes of construction the district was divided into five residencies with an engineer in charge of each. The contract for earthwork which was awarded to the lowest bidders, Messrs. Grant, Smith and Company and McDonnell Limited, called for completion of the work by May 1, 1923, at a total cost of $1,660,279.40. The contractors let the greater portion of the work to sub-contractors who again sublet to men with small outfits. The work was carried on vigorously during the summer and late on into the fall. One dragline excavator was operated throughout the winter.

Solid rock in quantities considerably greater than anticipated has been encountered in the inlet to Keho lake, but this is being removed without difficulty, after blasting, and the completion of the project will not be delayed on this account. North of the Oldman flume, gravel was encountered for about two miles and in the Turin district, principally on small laterals, a considerable amount of sand was excavated. The presence of these materials will undoubtedly cause large seepage losses and in some places lining of the canals may be necessary. Fifty-nine per cent of the excavation work was completed in 1921, although operations were not commenced until July. It is anticipated that the whole work will be finished without difficulty in 1922.

Other contracts were awarded as follows:—

Concrete and timber structures.—Messrs. A. G. Creelman and Company, $134,719.95.

Masonry and timber trestle work.—Messrs. A. G. Creelman and Company, $364,619.50.

Timber for small structures.—The Jewell Lumber Company, Limited, $30 to $38.90 per M for timber, 29 cents per linear foot for piling.

Metal flume.—Pacific Sheet Metal Works, Limited.

Oldman river, 3,322 lineal feet at $11.25	$37,372 50
Willow creek, 588 lineal feet at $11.25	6,615 00
Total	$43,987 50

Steel Work.—Dominion Bridge Company, Limited. Oldman and Willow creek crossings, $110,386.

Wood-stave pipe syphon.—The Canadian Pipe Company, Limited.

Rocky coulee, 2,855 lineal feet at $32.15	$91,788.25
Kenex, 930 lineal feet at $32.15	29,899.50
	$121,687.75

UNITED IRRIGATION DISTRICT

Comprised within this district are what were formerly known as United and Lone Rock Irrigation Districts.

Districts	Irrigable	Non-Irrigable
	acres	acres
Former United District.....	14,947	26,334·4
" Lone Rock District.....	8,177	8,726·5
Present United Irrigation District.....	23,124	35,060·9

The Provincial Government engaged Mr. D. W. Hays as consulting engineer to report upon the project and on the desirability of a government guarantee of the proposed bond issue. A favourable report was given conditional upon there being a guarantee of adequate water rights. This matter was satisfactorily adjusted and authorization for the construction of the works was issued on June 29, 1921. The estimates prepared by the Board of Trustees were then approved by the Irrigation Council, which authorized a loan of $645,000 to cover expenditure in connection with the formation of the district, construction, and interest until the end of one year after the completion of the works.

A by-law was prepared, submitted to the ratepayers of the district on August 24, and passed by a large majority. The district was authorized to borrow $60,000 to cover preliminary and construction costs pending guarantee of the bonds by the Provincial Government. The contract for supervision and engineering was awarded to Mr. D. W. Hays, who had previously reported on the district.

For construction purposes the district adopted the system of letting small contracts to ratepayers in preference to awarding the contract in a lump sum. These contracts were awarded on the following basis: 60 per cent to be paid on monthly estimate, 15 per cent to be paid on satisfactory completion of contract, 25 per cent to be retained and held in trust to apply on assessments to be levied on the lands in respect of the charges due for bonds to be issued by the district.

Conditions in the district are particularly favourable for small contracts, as no expensive machinery is required and a considerable number of ratepayers have had previous experience in the construction of irrigation works. Satisfactory results have been obtained to date and it is anticipated that, under the conditions outlined, this method will prove the most economical.

The expenditure of the district up to December 31, 1921, was as follows:—

Overhead	$ 3,857 75
Engineering and inspection	10,943 15
Structures	2,680 82
Excavation	25,235 59
General	724 83
Total	$43,442 14

The work of surveys and construction will be resumed in the spring of 1922 and an effort made to complete the system during the year.

SOUTH MACLEOD IRRIGATION DISTRICT

By an order dated September 21, 1921, this district was officially declared to be formed. Originally it comprised 61,006.7 acres, but this included School and Crown lands which have been dropped for the present as special legislation must be passed

to make these lands taxable. A further reduction in the area amounting to 7,980.2 acres has been made on account of withdrawals, revision of classifications, and alkali investigations, so that the project now comprises only 49,649 acres.

The plans of the project have been approved and a reservation of 85,190 acre-feet of water from Waterton river has been made. Mr. D. W. Hays, who was employed as consulting engineer by the Provincial Government, has favourably reported upon the undertaking. One objection to this project was the number of holdings too large to be successfully operated as irrigation farms. This objection has been minimized by the withdrawal from the district of most of the large holders of land.

IRRIGATION DEVELOPMENT ASSOCIATION

This association, whose headquarters are located in the Board of Trade Building at Lethbridge, is still actively interested in irrigation development. Any matters which directly affect irrigation interests or the further development of the country centering on Lethbridge, are usually taken up through this medium. The association is doing very useful work in furthering the interests of irrigation in the dry belt. During the past year the chairman (Mr. G. R. Marnoch) and the members of the association appeared before the International Joint Commission at their hearings in Lethbridge in September, 1921, and presented the case of the farmers and business interests in connection with the division of the waters of the St. Mary and Milk rivers. The chairman also attended the hearings of the commission at Chinook, Montana. The association has also taken an active interest in the Waterton lake storage proposals, and in the whole question of the development of storage reservoirs in Alberta.

PROPOSED ROBSART-VIDORA IRRIGATION DISTRICT

Reconnaissance surveys of this project were made during 1920. At that time it was proposed to utilize Cypress lake as a reservoir and the proposed district was known as the "Cypress Lake Irrigation District". As, however, it is now intended to abandon Cypress lake as a reservoir it is considered that a more appropriate name for the district would be the "Robsart-Vidora Irrigation District".

During the season of 1921 a topographical and soil survey of the proposed district was made and detailed surveys of proposed dam sites on the Frenchman river were completed at the following locations: (1) NE. ¼ section 20, township 6, range 24, west of the 3rd meridian, (2) SE. ¼ section 29, township 6, range 24, west of the 3rd meridian, with a view to creating storage of 40,000 acre-feet on the Frenchman river; a detailed survey was also made of the land which will be flooded as a result of the construction of the reservoir and a canal system was projected from this reservoir to the irrigable lands. Detailed plans and cost estimates have since been completed and the following is a summarized estimate of the cost of the proposed development:—

Frenchman River Reservoir—

Expropriation of deeded lands	$ 27,315 00
Main dam	78,081 50
Spillway on main dam	31,654 47
Outlet to Frenchman river	1,987 50
Sucker creek diversion	4,434 00
Road diversion	5,000 00
Dam and headgate at head of main canal	10,064 00
Total cost of reservoir including all above items	$158,536 47
Main canal headgate to and including division gates	61,688 50
East branch main canal and distributaries	39,060 75
West branch main canal and distributaries	53,297 75
Total cost	$312,583 47
Add 10 per cent for contingencies	31,258 35
	$343,841 82

The cost per acre foot of the 40,000 acre-feet of available storage is ($158,536.47 ÷ 40,000) $3.96. The quantity of water stored per acre to be irrigated is 3.6 acre-feet and the cost of storage per acre irrigated for 11,125 acres is $14.24.

It is difficult to form any definite conclusions as to the suitability of the soil throughout the entire area owing to the nature of the salts present and uncertainty as to their movement after irrigation. It will only be possible to give full authoritative opinion after the soils have been analysed physically and chemically.

LITTLE BOW IRRIGATION DISTRICT

The order forming this district was made on March 5, 1922. Surveys were made and estimates were prepared in 1921. A comprehensive report was submitted to the district in June by their engineer who estimated the cost of the necessary works at $32,930. As the Government of the province has consented to assume half of this cost the capital cost per irrigable acre was at the time estimated at $5.85 and the annual charges per acre for maintenance and operation at 59 cents. Some slight changes are, however, now being made in the irrigable areas and two or three of the small schemes may be eliminated, which may slightly increase the per acre cost.

The project varies considerably from the usual irrigation district scheme in that in this case each individual farmer will construct his own works and purchase and install the necessary pumping equipment. The district as a whole will sell the necessary bonds for the construction of the headworks at High River and the Government of the Province of Alberta will reimburse the district following completion and construction of satisfactory works having sufficient capacity to divert, in addition to the district's own requirements, the fifty cubic feet per second for domestic purposes covered by license now held by the Government of the province. It is understood the arrangement is that half the bond issue will be purchased by the Government from the district, or bonds up to an amount not exceeding $18,000.

The total irrigable area has been estimated at 3,350 acres, but this area may be slightly increased as several riparian owners have recently expressed a wish to be taken into the district. Authorization to construct works under the provisions of the Irrigation Act will be issued as soon as the necessary advertising has been completed. Construction should be completed during the present year.

SURVEYS

North Saskatchewan Project

A general description of this project will be found in the annual report for the year 1919-20. Provision was made in the estimates for the year 1921 for detailed investigation of this project and four parties were placed in the field.

One party was employed on surveys for main canals from the North Saskatchewan, Clearwater, and Red Deer rivers to the proposed Buffalo Lake reservoir. The result of these surveys showed that it is quite feasible to make these diversions and that there are several possible routes from the Red Deer river. Another party was employed to make a reconnaissance of Buffalo lake and the surrounding country with a view to locating a feasible route for a canal from Buffalo lake to the irrigable lands. In addition to this a reconnaissance, without instruments, was made of approximately 500 miles over various possible canal routes. Two levelling parties were employed to run levels along township lines throughout the possible block of land commanded and to gain all possible data in regard to its topography and general suitability for irrigation.

From the information gained in the field tentative studies have been made of the available water supply, probable irrigable areas, required canal capacities and general distribution system. Two alternative schemes have been studied to some extent, one anticipating the use of Buffalo lake as a storage reservoir and the other the use of Sullivan lake. Sullivan lake is a more economical reservoir site than Buffalo lake as a larger area of land can be commanded from it, and the proposed Sullivan lake route to the irrigable land is more direct than the Buffalo lake route. There are a number of other advantages which the Sullivan lake route has over the Buffalo lake route, and it is proposed to investigate it thoroughly during the next field season. Tentative estimates compiled show the following:—

	Commanded area	Irrigable area
	acres	acres
Under Buffalo lake route.....	3,003,760	1,564,784
" Sullivan "	3,538,760	1,778,784

The estimated capacity of the proposed canal from the Red Deer river to the storage reservoir (Buffalo lake or Sullivan lake) is about 10,300 cubic feet per second, and of the proposed canal from this reservoir to the irrigable lands about 22,600 cubic feet per second.

With storage on the North Saskatchewan river of approximately 239,000 acre-feet (estimated capacity of reservoirs investigated by the Water Power Branch) and a further storage capacity of approximately 1,000,000 acre-feet at either Buffalo or Sullivan lake, it is estimated that there is sufficient water available from the North Saskatchewan, Clearwater, and Red Deer rivers to provide adequately for all irrigable land under either of the proposed schemes.

During the coming season five parties will be put in the field with a view to gaining sufficient further information to permit of preliminary estimates being prepared. These parties will be made up as follows: two reconnaissance parties of thirteen men each, two levelling parties of thirteen men each, and one reservoir-site party of three men.

Lethbridge Southeast Project

To complete the plane-table surveys of this project commenced in the year 1919, one five-plane-table party was employed during 1921. A small party was also employed to make a classification of all lands in the Alberta Railway and Irrigation Company's block and of certain irrigable lands which had not been plane-tabled in some of the other tracts. Both of these parties were employed only for a portion of the season on this project and were then transferred to other work.

During the winter a survey was made on the ice of that portion of the upper Waterton lake situated in Canada. It was the intention to make a survey of the whole of this lake, but the necessary permission to make such a survey on the United States side was not obtained. This work was done with a view to creating storage capacity of 150,000 acre-feet by the construction of a 50-foot dam at the "Narrows" between the upper and lower Waterton lakes. The total estimated cost to create 150,000 acre-feet storage at this site is $960,383, or $6.40 per acre-foot of storage capacity.

The soil conditions of the land in this project were investigated. Four hundred and forty-four soil groups were analysed and from tests made by the electrolytic bridge the following results were obtained:—

Alkali absent to a depth of at least 5 feet..	241 groups
" " above the 3-foot depth..	114 "
" " " 1½-foot depth..	62 "
" " " ½-foot depth	16 "
Alkali present at all depths to 5 feet..	11 "

Further analyses showed that the groups were divided as follows: Suitable soil conditions for irrigation, 423 groups; unsuitable soil condition for irrigation, 21 groups. The district as a whole is comparatively free from alkali.

Some study was given to the storage capacity required on the St. Mary river at the proposed St. Mary Lake reservoir site in the United States Glacier National park. The development of this reservoir was recommended by the International Joint Commission at its session at Ottawa on October 6, 1921. The required capacity indicated from studies made of the stream-flow records of the St. Mary river is 122,000 acre-feet, making the total required capacity of the Sherburn and St. Mary lakes reservoirs 200,000 acre-feet. With this storage capacity in the St. Mary river and a canal from the river with a capacity of 1,200 second-feet Canada could divert during six months of the open-water season a yearly average quantity of 377,694 acre-feet. This, with the additional supply available from the Waterton, Belly, and Milk rivers, would provide adequately for all lands tributary to the St. Mary river in Canada.

The final figures worked up in regard to irrigable areas are as follows:—

Alberta Railway & Irrigation Co. Taber District..	17,000	acres
Alberta Railway & Irrigation Co. under water agreement..	79,671	"
Alberta Railway & Irrigation Co. possible enlargement.. ..	54,046	"
Additional area Lethbridge Southeastern tracts..	336,662	"
Total..	487,379	"

The total area of 487,379 acres is that for which water must be provided and is the basis of the water supply study now being completed. The 17,000 acres in the Taber district, and the 79,671 acres of the Alberta Railway and Irrigation Company are now provided for. The remaining 390,708 acres can be irrigated by the ultimate development of the system, and the estimates of cost submitted were made for the development of this area. The estimated constructional cost to irrigate this area is $40 per acre.

The doubt concerning the possibility of utilizing Waterton lakes for storage purposes makes the ultimate development uncertain, while the enlargement of the main canal of the Alberta Railway and Irrigation Company is an expensive item of cost. Further than this, the cost of irrigating several of the small tracts is high, owing to the long lengths of canal necessary to carry the water to them. It would seem that an economical present development might be one comprising only those tracts which are more accessible to the source of supply.

Taking a broader view, however, and considering future irrigation development, it should be realized that the only chance the comparatively expensive tracts have to receive irrigation water is by their inclusion initially in the larger project, because while these tracts could be served at an initial constructional cost of about $40 per irrigable acre, the cost to serve them at some later stage after the cheaper tracts were developed, would in all probability be twice this amount.

Detailed estimates of cost have been prepared. Topographical and structural maps of twenty-one districts have been completed in connection with this project, showing topography and the design of the distributary system. Profiles of all canals of greater capacity than twenty-five cubic feet per second have been plotted as well as detailed plans of the various sites and larger structures. These plans are filed in the office of the Reclamation Service at Calgary, Alberta.

Retlaw-Lomond District

A general description of the surveys already made of this district was given in the annual report for the year 1920-21. Previous surveys anticipated the extension of the Lethbridge Northern project to serve these lands, but the possibility of irri-

gating them from an enlargement of the Canada Land and Irrigation Company's system has always been recognized. During the year a study was made of the main canal system of the Canada Land and Irrigation Company and an estimate of cost was compiled for an enlargement to serve approximately 100,000 acres in this district, while a cost estimate was also made for a similar enlargement of the Lethbridge Northern system.

The estimated cost of the necessary enlargement of the Canada Land and Irrigation Company's system is approximately $2,496,282 or $25 per acre for the 100,000 acres served thereby. To this is added $9.20 per acre, the estimated cost of the lateral system necessary to serve this area, making a total constructional cost of $34.20 per acre.

The cost of the necessary enlargement of the Lethbridge Northern project, allowing for additional storage of 120,000 acre-feet on the Oldman river, has been estimated at approximately $3,140,590, or $31.40 per acre. To this must be added $9.20 per acre, the estimated cost of the necessary lateral system, making the total constructional cost $40.60 per acre. It is estimated that there is sufficient water available from either the Bow or the Oldman river for the 100,000 acres in the Retlaw-Lomond district, but whereas in very dry years the supply from the Bow river may become critical, an adequate supply from the Oldman river would be assured each year.

From these comparative costs it would appear that the possibilities of shortage of water in Bow river are not considered sufficiently imminent to warrant an added expenditure to the district of $6.40 per acre. These estimates of cost are based upon reconnaissance surveys and should not be considered as final. Further plane-table surveys of the district are to be made during the field season of 1922 to definitely determine the irrigable area and to design and estimate the cost of the canal and lateral systems required.

Proposed North Retlaw District

The lands comprising this district are tributary to the canals of the Canada Land and Irrigation Company, and lie almost immediately north of the company's lateral "A," in township 13, range 17, west of the 4th meridian. Plane-table surveys were made of the lands in this district during the season, and detailed plans and estimates have been completed. The total estimated irrigable area is 2,031 acres and the estimated capital cost is $98,943, or $48.71 per irrigable acre. This scheme is considered feasible and the district is now in process of organization.

Proposed South Retlaw District

The land comprising this district lies in townships 11 to 13, range 17, west of the 4th meridian. The area is divided topographically into two blocks, one lying to the north and the other to the south of the Lomond branch of the Canadian Pacific railway. Plane-table surveys were made of the whole of the area during the season and detailed plans and cost estimates have been completed.

The estimated irrigable area in the northern tract is 3,475·7 acres and in the southern tract 2,217·2 acres. Water can be diverted to these lands from a point on the canal of the Canada Land and Irrigation Company above the drop in section 23, township 13, range 18. The estimated cost of construction of the northern tract is $241,815, or $69.57 per acre, while the cost of construction for the southern tract is $127,944, or $57.70 per acre.

Proposed Tide Lake Project

A reconnaissance was made of certain lands in townships 18 to 21, ranges 8 to 11, in the vicinity of Tide lake, Alberta, with a view to extending the canals of the Canadian Pacific Railway Eastern Section tract to serve them. It was found impra-

ticable to irrigate these lands by the extension proposed. The possibility of irrigating these lands either by pumping from the river or by an extension of the proposed North Saskatchewan project will be investigated during the coming field season.

Proposed New West Irrigation District

The lands comprising this district lie almost wholly in the west half of township 14, range 16, west of the 4th meridian, and are tributary to and will receive their water supply through the canals of the Canada Land and Irrigation Company. Plane-table surveys were made of this district during the season and detailed plans and cost estimates have been completed. The total estimated irrigable area is 7,629·8 acres. The estimated capital cost of development is $384,959, or $50.45 per irrigable acre. This district is now in process of organization and the plans have been approved by the Minister of the Interior subject to some minor changes which will be made.

Proposed Eyremore District.

Surveys were made of certain lands in townships 16 and 17, ranges 16 and 17, west of the 4th meridian, tributary to the canal system of the Canada Land and Irrigation Company. This district comprises an area of 4,092 irrigable acres of first-class land. Detailed plans and cost estimates have been completed. The estimated capital cost of the development is $61.40 per irrigable acre, which is higher than the interested land owners anticipated, and they are undecided as to the advisability of forming a district.

Proposed River Bow District

This district lies immediately to the south of the Eyremore district. Plane-table surveys were made during the season and detailed plans and cost estimates have been completed. This district, like the Eyremore district, is tributary to the canals of the Canada Land and Irrigation Company and will receive water through that system. The total irrigable area is 5,791·9 acres. The estimated capital cost is $314,357, or $54.27 per irrigable acre. No petitions have yet been presented for the formation of this district and no recommendations in regard to it have been made.

Proposed Pearce Irrigation District

Surveys were made of certain lands in townships 9 and 10, ranges 24 and 25, west of the 4th meridian, in the vicinity of Pearce, Alberta, with a view to irrigating these lands by pumping water either from the Oldman river or from the canal system of the proposed Macleod district. Several different schemes were investigated and comparative cost estimates have been prepared. It was found that the cost of the proposed development is excessive and the scheme is not recommended as feasible.

Proposed Beaver Creek Project

A reconnaissance survey was made of the Tennessee, Hillsboro, Ashdale, and Summerview districts to determine the feasibility of irrigating these lands.

The following conclusions were reached as a result of this survey:—

1 It is not feasible to irrigate lands in the above location from the Oldman river.
2 It is quite feasible to divert water for irrigation from Tennessee and Beaver creeks.
3 There is an area of approximately 9,000 acres tributary to Beaver creek which can be irrigated provided there is sufficient water for this purpose.
4 In order to irrigate any considerable area of land from either of these creeks storage is necessary.

The headwaters of Beaver, Five Mile, and Nine Mile creeks were explored in 1920, but no suitable reservoir sites were found. The only site that was considered worthy of further investigation is located on Five Mile creek, in township 9, range 26, west of the 4th meridian. A complete survey of this site was made, as a result of which it was estimated that 3,500 acre-feet could be stored. A tentative plan was worked up providing for a development of sixty-five quarter-sections, each containing an irrigable area of forty acres or less. In 1921 detailed surveys of the project were made and plans and cost estimates have since been completed showing that approximately 2,600 acres are irrigable at a cost of $55.56 per acre.

Proposed Flood Scheme for Medicine Hat Eastern District

By an order dated February 24, 1921, the Medicine Hat Eastern District was formed. At the request of the Provincial Government, Mr. George G. Anderson, consulting engineer, of Denver, Colorado, made an investigation of the proposed project. His recommendation was that the Government should not undertake to guarantee the bonds of the district on account of inadequate water supply. Later the district employed Mr. D. W. Hays to make an investigation and to modify the plan in such a way as to overcome the objection raised by Mr. Anderson. Mr. Hays submitted his report on July 20, but he was unable to suggest any modified scheme as adequate storage facilities are not available.

This department was requested in November by the district to investigate the feasibility of a scheme using flood water only and the necessary further surveys were made during the following month. A decision as to this scheme has not yet been reached. A comprehensive report on the project will be found in the report of the Reclamation Service for 1921.

Medicine Hat Southern Irrigation District

In the annual report for 1920-21 a general outline of the plan proposed for irrigating this district and an estimate of the cost of the works were given. The district was formally erected on January 11, 1921. Mr. George G. Anderson was engaged by the Provincial Government to report upon the project. He found the water supply to be inadequate and recommended that no assistance in the way of guaranteeing the district bonds be given by the Government. Mr. D. W. Hays was then requested by the district officials to outline a scheme that would be free from the objection raised by Mr. Anderson. His report suggested that the irrigable area be reduced to 3,000 acres and that each unit in the scheme contain eighty irrigable acres. Further field-work was done by this department following the receipt of Mr. Hays' report, as a result of which an estimate of cost of $52.47 per irrigable acre was obtained.

It would appear from a careful study of the records that a sufficient supply of water has been available in seven out of nine years to apply from twelve to eighteen inches. As, however, the records of Paradise creek, one of the sources of supply, have only been taken during one year, it has been deemed advisable to defer making a recommendation with regard to the amended scheme until further records on this creek are obtained.

Proposed Willow Creek Project

Residents in townships 9 and 10, range 27, west of the 4th meridian, petitioned for surveys to determine the feasibility of irrigating land in these townships. A reconnaissance of the area was made and the following conclusions were reached:—

1 The controlling feature is a high cutbank on the west side of Willow creek, just opposite the town of Granum, in section 36, township 10, range 27, and

in order to command the lands under consideration the main canal must be at a sufficiently high elevation to avoid this.

2 The proposed intake must be either on Trout creek or on Willow creek, above the mouth of Trout creek.

3 The lands which will be commanded by such a scheme are in every respect suitable and irrigation would be beneficial.

4 To irrigate lands from either Trout or Willow creeks, storage would be required.

The headwaters of both Trout and Willow creeks were explored and two reservoir sites were located, one on Trout creek in sections 27 and 34, township 11, range 28, and the other on a branch of Willow creek in section 6, township 14, range 29, west of the 4th meridian. Estimates for the project are: Total irrigable area, 4,472 acres; total cost per acre, $58.14; storage capacity, 7,659 acre-feet.

During the period from 1911 to 1919, inclusive, by making use of the reservoir site on Trout creek, it would have been possible to provide an adequate water supply for the irrigable lands with the exception of four months in 1919 and a short period in 1918. From the point of view of water supply, therefore, the project appears feasible.

Proposed Manyberries Creek Reservoir

Early in the year an investigation was made of storage possibilities on Manyberries creek. As a result of this investigation a reservoir site was located in section 34, township 4, range 6, and sections 2, 3, and 11, in township 5, range 6, west of the 4th meridian. Below this reservoir approximately 4,000 acres of hay lands are irrigable. Without storage facilities it is only possible to irrigate a small part of this acreage in the early spring. The effect of providing storage facilities would be not only to increase greatly the irrigable area but also to enhance the yields and make possible the growing of other crops which require frequent applications of water. It was estimated that by providing a reservoir at the site mentioned above, 4,000 acres can be irrigated at a cost of $34.14 per acre.

Proposed Champion Irrigation District

The development of this project is the result of a reconnaissance, made during 1920, of a scheme to supply water for the proposed Retlaw-Lomond district. It was found that the proposed canal from the Highwood river to lake McGregor, which would be necessary to carry the water for the Retlaw-Lomond district, commands a fairly large tract of good land (estimated at 58,000 acres), mostly in townships 14 and 15, ranges 22, 23, 24, 25, and 26, west of the 4th meridian which could be irrigated. A tentative study of the stream-flow records of Highwood river indicated an available water supply for not more than 50,000 acres. Since these lands are, because of their location, more entitled to the Highwood river water than lands in the Retlaw-Lomond district, the scheme has been confined to these lands, now known as the Champion district.

A reconnaissance of the headwaters of the Highwood river was made during 1921 for the purpose of locating a suitable site in which to store the flood waters. A site was located just northwest of the town of High River in what appears to be an old river channel. It is estimated that by constructing a forty or fifty-foot earth dam here thirty thousand to forty thousand acre-feet of water could be stored very cheaply. In conjunction with a known reservoir site at Frankburg lake, in township 16, range 22, just east of the town of High River, it is estimated that sufficient storage (60,000 acre-feet) could be developed. Surveys of this scheme were made, the main canal and some of the distributaries located and section line levels were run over the irrigable areas completed. Complete plane-table surveys will be made in 1922 and estimates and detailed plans will be prepared.

SESSIONAL PAPER No. 12

Reservoir Survey at the Junction of Gap and Maple Creeks

A survey was made of a proposed reservoir site at the above location and a plane-table survey was also made of Tenaille or Sixteen Mile lake, it being considered that a very cheap reservoir might be developed here for the purpose of regulating the flow of Maple creek and providing water for schemes already developed or contemplated along the creek towards Bigstick lake. The investigation of this site showed that a reservoir with a capacity of 4,220 acre-feet could be developed at a cost of approximately $5.40 per acre-foot, and that the cost of storage per irrigable acre for 3,000 acres would be approximately $7.60, the total estimate being $22,980.

It is proposed under this scheme to divert the available waters of Maple creek into a natural channel leading to Tenaille or Sixteen Mile lake by means of a headgate in the right bank of Maple creek. The natural channel will require enlarging and improving. A system of dykes averaging seven feet in height will be required to control the water. The general topographic features are such that a storage reservoir can be developed at reasonable cost.

Survey of Maple Creek Flats

A survey was made of certain lands in the vicinity of the town of Maple Creek, with a view to irrigating them from Maple creek and Gap creek. Canals to serve these lands were located from both of these creeks and a complete topographical survey was made of the lands commanded. Reservoir sites were surveyed on these creeks at points where it was considered that storage might be created. The reservoir sites surveyed are at the following locations: Gap creek, section 27, township 10, range 27, west of the 3rd meridian; Maple creek, section 7, township 10, range 26, west of the 3rd meridian; Downie lake, sections 1, 2, 11, and 12, township 10, range 28, west of the 3rd meridian.

A final study of this development has not yet been completed. There is considerable doubt as to the suitability of these flats for irrigation. The soil consists of a very heavy clay containing some alkali. An investigation of the soil conditions was made during the season but the results are not yet known. There are no serious topographical obstacles to this development, but considerable storage is required for the irrigation of even a comparatively small area.

REPORT ON DUTY OF WATER INVESTIGATIONS FOR 1921—A SUMMARY OF RESULTS OBTAINED AT BROOKS, VAUXHALL, AND COALDALE

The season of 1921 was unfavourable for crops. Seeding was started on April 19, but owing to low temperature in April and May growth was slow. The total precipitation, April to September, inclusive, was 8·26 inches or nearly double that of 1920, which had a total of 4·97 inches. The mean temperature for the period was 56·20°. On the whole the season was backward, owing to a dry spring, low mean temperatures, and a rather cold, wet fall. Drought and hot winds in June did considerable damage to crops, especially where these were insufficiently irrigated.

The following tables show the rotation schedule adopted at Brooks in order to maintain the general fertility of the farm, and that certain crop series may have from year to year, as nearly as may be, the same conditions of soil fertility. For 1921 the duty of water for wheat has been determined under three different conditions of soil fertility: (1) immediately following leguminous crops; (2) following oats, after peas-beets; (3) following barley after oats-potatoes. In a similar manner the duty

of water for oats is found under four different conditions of soil fertility, barley under three, and potatoes under two.

Rotation A Alfalfa five years, potatoes, wheat, flax.
" B Alsike clover four years, roots, oats (*a*), wheat, oats (*b*).
" C Grass three years, potatoes, barley, wheat.
" D Red clover two years, oats, barley.
" E Peas, wheat, oats, barley.

With this schedule it is possible to have in each season grain crops (wheat, oats, or barley) coming immediately after legumes and grasses, second year after legumes, and third year after legumes. This gives an opportunity of securing practical evidence of the phenomena that crops grown on fertile soil require less water to produce a maximum yield than when grown on soils from which, on account of successive cropping without the introduction of organic matter or legumes, the available plant food has been materially reduced.

Wheat.—In rotation E the maximum yield of 42·5 bushels per acre was produced under a total depth of 1·92 feet of water. In rotation C the maximum yield of 34·9 bushels per acre was produced under a total depth of 2·09 feet. In rotation B the maximum yield of 39·0 bushels was produced under a total depth of 2·42 feet.

Summarizing the results from the three wheat series, it is shown that the maximum yields were produced with an average total depth of 2·14 feet of water, of which 0·42 was rainfall. In each series, with the exception of that in rotation B where the maximum yield of 39·0 bushels coincides with the maximum application on plot 69-E, additional irrigations produced a decrease in yield. The dry plots gave some straw but no grain. The maximum yield of the three series, 42·5 bushels per acre, with a total depth of 1·92 feet of water was obtained from land which grew peas in 1920.

Oats.—In rotation D the maximum yield of 143·0 bushels per acre was produced under a total depth of 2·09 feet of water. In rotation B (*a*) the maximum yield of 138·1 bushels per acre was produced under a total depth of 1·92 feet. In rotation E the maximum yield of 91·2 bushels per acre was produced under a total depth of 2·39 feet. In rotation B (*b*) the maximum yield of 84·7 bushels per acre was produced under a total depth of 2·06 feet.

Summarizing the results from the four oats series, it is shown that the maximum yields were produced with an average total depth of 2·11 feet of water, of which 0·42 foot was rainfall in D and B (*a*), and 0·39 foot was rainfall in E and B (*b*). In all series except E excessive irrigation gave decreases in yield. The maximum yield of the four series, 143 bushels per acre, with a total depth of 2·09 feet of water, was obtained from land which grew clover in 1920.

Flax.—The flax plants suffered from wilt and the results from the application of the irrigation schedule were so unreliable that the data were discarded.

Barley.—In rotation E the maximum yield of 49·2 bushels per acre was produced under a total depth of 1·69 feet of water. In rotation D the maximum yield of 60·5 bushels was produced under a depth of 1·69 feet. In rotation C the maximum yield of 52·0 bushels per acre was produced under a total depth of 1·69 feet. Summarizing the results from the three barley series, it is shown that the maximum yields were produced under an average total depth of 1·69 feet of water, of which 0·35 foot was rainfall. The dry plots produced no yield.

Alfalfa Seed Production.—The maximum yield of alfalfa seed, 3·7 bushels per acre, was produced under a total depth of 1·57 feet of water, of which 0·57 was rainfall. This yield was produced from that portion of plot 41-E which was seeded in hills. It was coincident with the maximum depth applied. The dry plot and plot 41-B, which received one 3-inch irrigation, produced no seed.

Where the alfalfa seed was sown in rows, the maximum yield, 2·38 bushels per acre, was produced under a depth of 1·57 feet of water. The dry plot and the plot receiving one irrigation produced no yield. Where the alfalfa was sown in drills, the maximum yield, 3.20 bushels per acre, was produced under a total depth of 1.57 feet of water. The dry plot and the plot which received one irrigation produced no yield.

The season was very unfavourable for the production of alfalfa seed. Late frosts damaged the blossoms, which did not set well. The seed all through the Brooks district germinated very low and had a high percentage of hard seeds.

Peas.—The maximum yield of peas, 60.3 bushels per acre, was produced on plot 20-A under a total depth of 2.47 feet of water. The dry plot produced no yield. Plots 20-B and 20-C which received total depths of 2.81 and 3.14 feet, produced decreasing yields, 58.4 and 57.2 bushels respectively.

Potatoes.—In rotation A the maximum yield, 421 bushels per acre, was produced under a total depth of 1.69 feet of water, of which 0.69 foot was rainfall. The non-irrigated plot produced at the rate of 120 bushels per acre. The crop on this rotation was preceded by clover.

In rotation C the maximum yield, 283 bushels per acre, was produced under a total depth of 1.61 feet of water, of which 0.61 was rainfall. The crop on this rotation was preceded by grass. In both rotations the yields increased with the increase in the depth applied up to the maximum, excepting plots 86-A and 86-B in rotation C.

Summarizing the results of the two potato series, it is shown that the maximum yields were produced under an average depth of 1.65 feet of water of which 0.65 was rainfall.

Alfalfa Hay.—In rotation A 1919 seeding, the maximum yield, 5.57 tons per acre, was produced under a total depth of 3.92 feet of water. The non-irrigated plot produced 0.05 ton per acre. In rotation A, 1920 seeding, the maximum yield, 5.73 tons per acre, was produced under a total depth of 2.42 feet of water. The non-irrigated plot produced 0.42 ton per acre. In rotation B, 1920 seeding, the maximum yield 5.50 tons per acre, was produced under a total depth of 3.42 feet of water. The non-irrigated plot produced 0.10 ton per acre.

Summarizing the results of the three alfalfa series, gives the maximum yields produced under an average depth of 3.25 feet of water. The average maximum yield is 5.60 tons. The average depth used in producing this yield is 2.93 feet.

Grass Hay. The maximum yield of grass hay, 1.87 tons (3,750 pounds) per acre was produced under a total depth of 1.82 feet of water, of which 0.32 foot was received as rainfall. The dry plot produced one ton per acre.

Golden Bantam Sweet Corn.—The maximum yield of sweet corn, 21.50 tons green weight per acre, was produced under a total depth of 1.07 feet of water, of which 0.57 foot was rainfall. The dry plot produced 7.95 tons per acre.

Dry Land Wheat.—No yield whatever was produced where wheat was grown on non-irrigated land.

Duty of Water Investigation at Vauxhall

Duty of water investigations were commenced in the spring of 1921 on the Kinlock farm of the Canada Land and Irrigation Company, near Vauxhall. The work formerly carried on at Ronalane was abandoned in favour of the Vauxhall location, as the latter farm is situated in the most thickly settled and best farmed area of the Canada Land and Irrigation Company's tract where the results obtained

from irrigation investigations can be observed by a large number of resident farmers. The Kinlock farm has a more uniform soil than the Ronalane farm and is better adapted for experimental work.

The failure of the company's local representative to apply the irrigations according to the arranged schedule makes the data obtained more or less unsatisfactory, as it is not known whether additional irrigations would have increased or decreased the yield, or what influence the irrigations would have had if applied at the right time.

Canada Blue Peas.—The maximum yield, 24.4 bushels per acre, was produced under a total depth of 1.39 feet of water, of which 0.99 foot was received in three 4-inch irrigations.

Marquis Wheat.—The maximum yield, 43.2 bushels per acre, was produced under a total depth of 1.71 feet, of which 1.32 feet were received in four 4-inch irrigations.

Leader Oats.—The maximum yield, 116.4 bushels per acre, was produced under a total depth of 1.72 feet, of which 1.32 feet were received in four 4-inch irrigations.

Bark's Barley.—The maximum yield, 47.6 bushels per acre, was produced under a total depth of 1.71 feet, of which 1.32 feet were received in four 4-inch irrigations.

Gold Coin Potatoes.—The maximum yield, 376 bushels per acre, was produced under a total depth of 1.82 feet, of which 1.25 feet were received in five 3-inch irrigations.

Grimm Alfalfa (Ronalane).—The maximum yield, 3.28 tons per acre, was produced under a total depth of 2.39 feet, of which 2.00 feet were received in four 6-inch irrigations.

Duty of Water, Coaldale, Alberta

Duty of water investigations at Coaldale were commenced on May 9, when soil moisture determinations were made on all the tracts under observation. Water was available to the farmers about May 15. Irrigation of alfalfa began towards the end of the month.

All alfalfa fields except No. 302 received two irrigations. No field yielded more than two cuttings. Tract No. 324 produced the heaviest first cutting, 2·84 tons per acre. Plot 305 produced the heaviest total yield, 4·22 tons per acre for the two cuttings, with a total depth of 2·19 feet of water.

For the thirteen tracts in forage crops during 1921 the average total depth of water received was 1·94 feet, and for the five tracts in grain crops the average was 1·25 feet. For all tracts the average total depth of water received was 1·75 feet. The average total depth of water received for the grain crops for the years 1913 to 1921 was 1·51 feet; the average duty of water for the same period for grains was 0·60 foot. For the alfalfa and grasses the average total depth received for nine years was 2·00 feet, and the average duty 1·22 feet. For all tracts under consideration the average total depth received for the nine-year period was 1.95 feet; the average duty 1·16 feet.

Discussion of Summarized Data

The duty of water for any locality will vary from year to year, principally in accordance with the amount and seasonable distribution of the precipitation, and to a lesser extent as influenced by temperature and the condition of soil and subsoil. Therefore, in order that the water requirements of crops may readily be compared,

from one year to another, or between different localities, it is best to consider that crops annually receive a certain amount of water—precipitation plus irrigation—and designate this amount the "Total Depth Received."

The following table gives a summary of the data collected from the Coaldale, Ronalane, and Brooks stations during the period 1913 to 1921, inclusive. It is not intended to quote these figures as representing the exact depths required for the various crops, but rather as showing the results of our investigations to date. The column headed "Yield" is inserted as a useful index to the crops produced at these three stations. The column headed "Depth" shows in feet the total depth of water received (irrigation plus precipitation).

The *average depth* shown is the average of the depths at the different stations weighted according to the number of years during which records have been taken at each place. The column marked "Average Depth" shows the average for Coaldale, Ronalane, and Brooks.

The data at Coaldale are based on the results gained by average farmers irrigating their own fields and cover a period of eight years; the yields at Coaldale have been omitted because they would not be comparable with the results obtained at the other places.

The results at Ronalane are based on plot work carried on consistently for six years. The results at Brooks are based on accurate and consistent plot work covering a period of four years. For Ronalane and Brooks the figures shown represent the average, at each place, of the total depths of water producing the maximum crop yield in each year. For Coaldale the figures represent the average for ordinary crops in each year.

The mean summer precipitation for the past five dry years 1917 to 1921 inclusive was: Ronalane, 0·49 ft.; Brooks, 0·54 ft.; Coaldale, 0·62 ft.; mean of the three stations, 0·55 ft.

We find, therefore, that even during the past five dry seasons in southern Alberta we have had enough precipitation, when added to the legal duty, to produce the optimum possible duty, viz., rainfall 0·55 feet plus legal duty of water 1·5 feet = 2·05 feet.

Crop	Coaldale	Ronalane		Brooks		Average depth
	Depth	Yield	Depth	Yield	Depth	
Wheat	1·41	45·9	1·91	44·8	2·06	1·72
Oats	1·52	91·4	2·15	100·1	1·90	1·83
Barley	1·61	58·5	1·74	56·4	1·89	1·76
Peas		44·0	2·31	56·2	2·32	2·31
Potatoes	0·83	371·0	2·03	312·0	1·95	1·78
Flax				24·4	1·95	1·95
Alfalfa seed				8·4	1·34	1·34
Alfalfa	2·16	3·32	2·13	5·82	2·96	2·31
Grasses	1·94			1·73	1·72	1·88
Sugar beets		1·35	1·66	16·2	1·82	1·71

The average depth noted in the above table indicates quite clearly the total depths required for the crops listed, when grown in that part of Alberta lying south of township 28, and exclusive of that strip of country lying immediately east of the foothills. Assuming, as in previous reports, that eventually all irrigated farms will be seeded down, one-half to alfalfa and one-half to common grains, we have:—

Average depth for wheat, oats and barley	**1·77 feet**
Average depth for alfalfa	**2·31 feet**
Then, total required for entire farm unit	**2·04 feet**

With legal duty at 1·50 feet, under this condition it would be necessary to rely on the seasonal precipitation to make up the additional 0·50 foot.

A more extended review of this work will be published in the separate annual report of the Reclamation Service for 1921-22.

Report of the Supervising Hydraulic Engineer of the Drainage Division, J. S. Tempest, M.E.I.C.

Following the practice of previous years, this report on drainage operations for the fiscal year ended March 31, 1922, has been prepared in a summarized form, dealing only with matter necessary for record and of interest to the public in general and drainage applicants in particular. Original and detailed reports and data have been filed at Ottawa for reference.

This is the third season since the formation of the Drainage Division and although there has not been time for the completion of many of the projects coming under its purview, highly satisfactory results are to be seen in several private schemes constructed or partly constructed. As a rule, however, the full benefit will not be apparent until sufficient time has elapsed to allow certain classes of land to dry out thoroughly and be prepared for cultivation or the growing of hay. No results of drainage initiated by the Government are yet to be seen, as the construction of Waterhen Lake project, the only one undertaken, will not be completed for another year.

An analysis of the drainage investigations made shows that the numerous projects vary greatly in character, and the amount of time and labour required to complete the reclamation of the land after the construction of the drainage works is dependent upon these characteristics. Practically every project presents a peculiar and distinct problem in itself and greater ingenuity is often required in determining the method of treating the land after drainage than in designing the drainage works. Lands requiring drainage may be divided into four principal classes and a project may include one or more of these classes

(1) *Lands bare of vegetation.*—In order of value and economy of total reclamation these lands that are bare of vegetation, other things being equal, come first. They are to be found in the beds of lakes and sloughs where the depth of water is sufficient to prevent the growth of rushes, flags, and aquatic reeds and grasses. The feasibility of their reclamation is dependent principally upon the cost of the drainage works, for as soon as drained the land is usually ready for seeding to timothy or other grasses without waste of time or any great expenditure of labour. After two or three years as hay meadows such lands are usually suitable for cultivation for ordinary farm crops.

(2) *Wild Hay Lands.*—Next in order of value and economy of reclamation are the native hay lands periodically flooded or permanently in a wet state. The common cause of these wild hay meadows is the building of beaver dams and the submersion of extensive tracts of valley land. The timber is killed by the flooding and in course of time falls and decays. Then follows the filling up of the area with silt and the growth of sub-aquatic plants including water grasses, the latter finally gaining the ascendancy. These meadows are commonly admirably adapted to and susceptible of irrigation or spring flooding after drainage, by the construction of hold-up gates at the outlet.

After the draining of Kleskun lake, in township 73, range 4, west of the 5th meridian, the owners were able to cut each year upwards of 5,000 tons of red-top, reed meadow-grass, and slough grass of fair food value that formerly could not be reached by the mower.

Cygnet lake, near Red Deer, Alberta, was lowered by a drainage ditch dug to facilitate railway construction, resulting in the reclamation or partial reclamation of about 3,000 acres of lake bed and slough. Lands formerly growing a coarse kind of reed meadow-grass and slough grass became available for farming purposes and the growth of a higher class of hay, while the lower portions formerly totally and permanently submerged are now producing coarse wild grasses that can be cut and harvested in dry and normal years.

A portion of Waterhen marsh covered by a luxuriant growth of red-top and slough grass was too wet to be reached by the mower until the water was let off in August, 1921, by the drainage canal constructed by the Dominion Government, thus enabling the settlers to cut a large acreage of hay that otherwise would have been wasted.

The lake beds of these projects commonly are bare of vegetation and belong to the first class of reclamation land, while the shores and the higher parts of the wet area belong to the second class of grass land.

(3) *Flags, Rushes and Floating Bogs.*—Between the two classes of reclaimable lands already described there lies in many projects a third class that presents a more difficult problem. Where the water is too deep to permit the growth of more or less useful wild grass and yet not deep enough to preclude the growth of semi-aquatic plants there is commonly a dense growth of flags and rushes and a condition known as "floating bog." After draining such areas there remains a difficult problem, one which has taxed the ingenuity of pioneers for many years. The dense mass of tangled roots and semi-decomposed vegetable matter retains water like a sponge and perpetuates the growth of worthless vegetation sometimes for years, notwithstanding the proximity of deep and well constructed drainage channels. The trampling of cattle or the lucky advent of a succession of dry years, and possibly the burning off of the dry plants and top part of the roots, expedites final reclamation. Projects consisting largely of lands of this character, although reclaimable, should be undertaken with great caution. The method of their final reclamation is still in the experimental stage, and while it might be good policy to clean up such areas when they form only a small proportion of a project, disappointment and loss might result in undertaking their reclamation where they form the major portion of the project. The character of the vegetation should be carefully studied before any drainage project is undertaken.

(4) Muskegs.—Finally, there is the fourth class of land, presenting the greatest difficulty of all to the final reclamation after drainage, viz., the areas commonly known as "muskegs." These are lands consisting of from one or two feet to eight or ten feet of sphagnum moss, often covered with a growth of decrepit and dwarf spruce and tamarack of no commercial value and usually so sparse and small as to be cleared at very little cost. The deep accumulation of moss is the difficulty overshadowing all others.

Explorations show that muskegs practically hundreds of miles in extent occupy a large portion of the north country, and systematic soundings from the railways to Hudson bay show a depth of moss varying from one to as much as twelve feet, although the latter depth is exceptional. The usual depth is from two to four feet and the underlying soil, although variable, is usually clay and silt suitable for farming land when reclaimed

Muskegs comprising portions of drainage projects, and small muskeg patches on homestead lands, have been successfully reclaimed and converted into good farm land, but no systematic method of treatment after drainage has yet been generally adopted. The subject is still in the experimental stage as far as the deeper muskegs are concerned, but where only two or three feet of moss overlie a suitable subsoil, successful and economical reclamation is fairly assured.

Experiments in the reclamation and cultivation of this class of land are now being carried on at agricultural experiment stations in Canada and the United States. The purpose of these experiments, however, is to ascertain what elements in the shape of fertilizers should be added to the peat soils to make them productive or more productive. Such methods, while interesting to agricultural science and to practical farmers in settled districts where farm land is of high value, are of little practical value in a pioneer country. The reclamation of muskeg and peat lands will of

necessity for the present be confined to such areas as can be reclaimed by drainage and the inexpensive practice of burning or trampling by cattle. Peat soils are commonly deficient in available phosphates and potash and these are left in limited quantities in the ash of plants after burning. Where the subsoil is clay and the peat soil or vegetable matter can be burned so that the plough can reach it, an ideal condition for agriculture is obtained.

Because of the vast areas of this class of land throughout the northern parts of all the provinces, practical experiments in the reclamation of small plots of typical land are advisable in the interest of future settlement. In view, however, of the meagre authentic information regarding the best methods and possibilities of profitable reclamation of the various classes of muskeg lands it is advisable to proceed with caution and not launch into large and costly undertakings until the success in smaller schemes has blazed a sure path to the desired goal.

SURVEYS AND INSPECTIONS, ALBERTA

(1) *Rocky Mountain House*

This project in townships 36, 37, 38, and 39, ranges 4, 5, 6, and 7, west of the 5th meridian, lies immediately south of the Alberta Central Branch, Canadian Pacific railway, near Rocky Mountain House and consists largely of wet grass lands and muskegs, broken by ridges running northwest to southeast and by numerous islands. Each section of wet land is bordered by a belt of spruce and tamarack, while the higher land is generally timbered with poplar and jack pine. On the higher ground surrounding the main swamp area are numerous hay sloughs which in some sections comprise nearly 50 per cent of the area. The soil is a sandy loam with a clay subsoil. In the open or floating muskeg the surface is from three to ten feet above the clay.

A petition was circulated among the resident owners from which it appears that they are in favour of a drainage project that would benefit their swamp lands, that they believe the swamps, when drained, can be profitably cultivated, that road building would be made possible to and across large areas now inaccessible, and that they are willing to pay the cost of a feasible drainage scheme in the form of taxes assessed against their land according to the provisions of the Drainage Regulations.

The total area of the project is 25,010 acres of which 16,157.1 acres are Crown land and 8,252.9 acres patented or homestead. This area is divided as follows: open muskeg and lake, 15,034.3 acres; timbered muskeg and lake, 8,237.1 acres; islands, 1,738.6 acres. The cost of drainage is estimated as $158,610, or $6.34 per acre.

Lanes Lake

This is in townships 37 and 38, ranges 14 and 15, west of the 4th meridian. Preliminary surveys were made of this project in 1920 and investigations were completed in 1921. The lake is situated about three miles west of the town of Castor, Alberta, on the Canadian Pacific railway. The natural outlet is a small watercourse running to Sullivan lake about seven miles distant. The fall averages about 2.5 feet per mile and to afford the necessary drainage this creek would have to be improved almost its entire length. It is estimated that the run-off from Lanes lake when drained would not materially raise the level of Sullivan lake.

The lake has a normal average depth of about 3.5 to 4 feet of fresh water with considerable areas of permanently wet, low-lying land around its shores, especially at the north and south ends where an abundant crop of good quality of red-top is growing. The soil is sandy loam with clay subsoil of excellent quality for agricultural purposes when drained.

Partial drainage is recommended, that is, to convert the present lake bed of 1,502.7 acres into hay lands and the present hay lands of 703.7 acres into cultivable farm lands. The total area reclaimed would be 2,233.4 acres and the estimated cost $28,000, or an average of $12.54 per acre of the lands benefited. The drainage district contains 58 per cent of Crown lands and 42 per cent alienated lands. Farm land in the district is valued at from $30 to $40 per acre and it is expected that the reclaimed land would be even more valuable. In view of the general desire of the resident owners and the comparatively low cost, construction is strongly recommended.

Chip Lake

A reconnaissance was made of Chip lake with a view to ascertaining the desirability and feasibility of draining it. The lake is situated in townships 53 and 54, ranges 9, 10, and 11, west of the 5th meridian, on the main line of the Canadian National railway, about eighty miles west of Edmonton. At normal level it has an average depth of less than six feet and covers an area of 18,000 acres.

In the district west of the lake is a wet area known as the "Forty Mile Muskeg," covering an area of approximately 40,000 acres. It was thought that the wet condition was caused by backing up of water and that if this were so a comprehensive drainage scheme might be devised for the reclamation of lake and muskeg, making available for agricultural purposes a total area of 90 sq. miles. The most feasible scheme would be the total reclamation of 10,415 acres and the partial reclamation for the growth of hay of 6,472 acres. The cost of such a scheme would be $518,617, or an average of $29 per acre. The lake at present serves no purpose except as a natural but shallow reservoir useful only for its regulating effect on stream flow. Owing to the high estimated cost of drainage of the lake as a separate project and the uncertainty regarding the economical treatment of the surrounding muskeg lands, the reclamation of this project is not recommended at present.

Tomahawk Creek

The lands in this project lie in townships 50, 51, and 52, ranges 5, 6, and 7, west of the 5th meridian, between Low-water lake and the Pembina river, about fifty miles west of Edmonton. A careful examination was made of the whole area and it was found that while small, swampy areas are located throughout practically all of the district, there are no large tracts of wet land requiring and susceptible of drainage at reasonable cost.

Shoal Lake

This shallow body of water is located eighty miles by road in a northwesterly direction from Edmonton, and thirty miles west of the town of Westlock on the Edmonton, Dunvegan and British Columbia railway, in townships 60 and 61, ranges 3 and 4, west of the 5th meridian. At normal water level the submerged area covers some 2,000 acres, but during high water periods an additional 1,000 acres are flooded, as there are expanses of low-lying meadow around the greater portion of the shore line. The average depth of the lake is three feet, and on account of the heavy growth of weeds during low water, it is difficult to row a boat across it. The natural outlet is Shoal creek, a small, debris-choked stream flowing in a valley about twenty feet deep out of the eastern end of the lake. The reconnaissance survey shows that 3,151 acres of wet and submerged lands can be reclaimed for agricultural purposes at a cost of $43,440, or an average of $13.45 per acre.

The resident landowners of the locality, as far as could be learned, are unanimously in favour of drainage, eighteen of them giving written statements to this effect. Several are very enthusiastic in regard to the possible hay-growing value of the land, and are desirous of purchasing a portion should construction be carried out. Taking the project on the whole it appears to be worthy of careful consideration and a detailed location survey is recommended.

Spotted Horse Lake

A reconnaissance survey was made of this project, which is situated forty miles west of Athabaska and about fifteen miles east of the Edmonton, Dunvegan and British Columbia railway, in townships 68 and 69, range 26, west of the 4th meridian. The area draining into Spotted Horse lake is about 164 square miles in extent and consists of large tracts of muskeg and swamp, covered with scattered growths of tamarack, spruce, poplar and birch, with numerous sandy ridges and sandy bottomed muskegs. To the north of the lake the soil is from six inches to a foot in depth and the subsoil is sand and boulders. To the south of the lake the soil is sandy clay with a clay subsoil.

For any other purpose than the production of hay the proposition is not worth while. As a ranching proposition the area might be improved by a number of shallow ditches and by deepening the outlet creek to drain the lake. This would cost approximately $62,000 and would insure abundant supplies of hay and pasturage for a large number of cattle, but the area could never be developed into a district suitable for settlement. This project is not recommended as one to be initiated by the Dominion Government under the provisions of part 4 of the Drainage Regulations.

Manawan Lakes

Manawan lakes are situated in a thriving farming country served by the Edmonton, Dunvegan and British Columbia railway and the Athabaska branch of the Canadian National railways. The centre of the district investigated is about twenty-three miles north of Edmonton. The country is well settled by thrifty farmers who have been in the district for an average of ten years. All the country about the lakes is cultivated and the lakes are a hindrance to its further development. Land in the district is worth from $65 to $75 per acre. Several farmers expressed their desire to purchase the lake bed at $50 per acre should the drainage project materialize. The lakes form a barrier to traffic and seriously increase the length and difficulty of the haul to town from the east and west. The drainage of the lakes would effect a considerable saving in road maintenance and would decrease the cost of hauling grain to the elevators. From every point of view the complete drainage of the lakes would be a great advantage to the whole district and to traffic north from Edmonton through the district. The soil of the lake bed is a good black loam and when drained would be capable of producing crops equal to the best the adjoining district now produces.

The area affected consists of 2,333·6 acres Crown lands and 7,644·4 acres alienated lands. The estimated cost of reclamation is $72,035, or an average of $2.50 per acre. On account of the proportion of Crown lands being less than fifty per cent, this project could not be initiated by the Dominion Government but could be undertaken by the landowners under the provisions of the provincial drainage laws.

Carrot River Triangle

The district known as the Carrot River Triangle comprises an area of about 1,1[illegible] square miles of submerged and periodically flooded lands, forming an irregular triangle between the Saskatchewan and Carrot rivers with the Sipanok channel as its base. About 920 square miles of the triangle lie in the province of Saskatchewan and 180 miles in Manitoba. Several partial investigations and surveys have been made in past years with a view to ascertaining the feasibility of reclaiming this land for agricultural purposes, but owing to the magnitude of the project, the inadequacy of the staff, and the short time spent on the surveys, these merely indicate that drainage appeared to be feasible and that the land when drained would be suitable for

farming. One of the greatest difficulties in the investigation was the practical impossibility of penetrating to and surveying the greater portion of the interior during the open season.

Two parties were detailed to make surveys and investigations of the drier portions along the banks of the Saskatchewan and Carrot rivers during the summer of 1921 and to establish bench-marks and base lines. Two more survey parties were assigned to the work in the late fall and the full force of four parties rushed the investigation of the interior as soon as the freeze-up made it possible to traverse the swamps and muskegs. Three parties continued work until the middle of December, and the fourth party remained until the end of January, 1922. The whole area has, however, not yet been covered and another season's work is required before a final recommendation can be made as to the feasibility and cost of the project.

From the information now available two alternative schemes suggest themselves:—

(A) The reclamation of the whole area by the construction of levees to keep out the flood waters of the Saskatchewan and Carrot rivers and a combined system of gravity drainage and pumping to take care of the run-off due to precipitation.

(B) The reclamation for the present of only the eastern portion of the triangle lying entirely in the province of Manitoba by the construction of levees around the whole of this portion and dealing with the run-off derived from precipitation by a pumping system.

Scheme A involves the reclamation of the entire triangle, consisting of 704,000 acres. The area is largely a mass of shallow lakes and open marshes with higher land along the boundary rivers, with a gradual slope to the east. The soil in the eastern area is an alluvial deposit of clay with from six inches to a foot of black muck, while in the central portion a large part consists of black muck or moss muskeg to a depth of from two to nine feet, with a subsoil of clay. The soils of the western portion have not yet been investigated. The higher land on the Saskatchewan and Carrot rivers, as well as along the interior watercourses, is a clay silt.

Scheme B involves the reclamation of only a part of the triangle, consisting of an area of 113,472 acres. This area is wholly in the province of Manitoba and from general appearances has the most suitable soil for agricultural purposes in the district investigated, and could be put under cultivation with but little preparation after drainage.

Waterhen Lake

The contract for the construction of the Waterhen Lake drainage project, which lies in townships 44, 45, and 45A, ranges 21 and 22, west of the 2nd meridian, was let to the Lount Engineering Company and the work of excavation commenced in May, 1921.

During the season a total of 469,411 cubic yards of earth was excavated, leaving approximately 165,000 cubic yards yet to be dug on the main lake and marsh canals. In addition to this there will be about 12,000 rods of levees to trim, 6,000 rods of catch ditches and a number of small laterals to construct, as may be found necessary after de-watering the lake and canal; also five bridges (two with hold-up gates), a number of culverts and other details to complete the works. The construction of much of this work can only be proceeded with when the lake bed and marsh have dried sufficiently to permit the use of teams.

It is expected that the water of the lake will be let off about midsummer of 1922 and that all the wild hay lands will be dry enough to cut while the grass is in good condition. Last season most of this hay could not be harvested because of wet conditions, except the meadows on the marsh which were de-watered in July.

PRIVATE DRAINAGE PROJECTS

Under the provisions of part 1 of the Drainage Regulations of the Dominion Government and the Reclamation Acts of the provinces of Alberta and Saskatchewan, twenty-five new applications were dealt with, the necessary surveys made and field maps and reports compiled. In addition to which twenty-six inspections of various projects were made and engineering assistance given to the owners of the schemes to ensure maximum results with a minimum amount of work in construction.

The general progress of the various schemes under development has been good, there being no abandoned or unsuccessful schemes reported or observed during the year.

PART V.

DOMINION WATER POWER BRANCH

REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF WATER-POWER, J. B. CHALLIES, C.E., M.E.I.C.

During the past fiscal year the Dominion Water Power Branch completed its tenth year as a distinct branch of the department and the year just closed marks the fifteenth since the administration of water-powers as a distinct resource was first undertaken by the Dominion.

A brief summary of some of the principal features of the year's work follows:—

ORGANIZATION AND SCOPE

The activities of the Dominion Water Power Branch in both their administrative and investigatory phases have been thoroughly maintained and extended during the fiscal year ending March 31, 1922. During this period the Hydrometric Survey work of the department has been consolidated under a Dominion Hydrometric Survey organization extending from coast to coast and made for the first time a complete responsibility of one branch. The field work of the department is based upon and built around this organization through which systematic and continuous stream measurement studies and general field analysis of the country's water-power resources are carried on throughout the Dominion except in the province of Quebec, where similar work is undertaken by the Quebec Streams Commission. In those provinces and territories where the Dominion administers the natural resources, the administrative functions of the branch have been maintained as heretofore.

LAKE OF THE WOODS CONTROL BOARD

Regulation of the levels and outflow of the lake of the Woods was, as in the previous year, a responsibility of the Lake of the Woods Control Board, which is made up as follows:

Mr. W. J. Stewart, Chairman, representing the Dominion.
Mr. J. B. Challies, Secretary, representing the Dominion.
Mr. H. G. Acres, representing Ontario.
Mr. L. V. Rorke, representing Ontario.
Mr. S. S. Scovil, Engineer.

Operations of the board throughout the year have as heretofore involved the continuous collection and study of all hydrological records relating to the watershed. On the whole, excellent results were secured in the past year's regulation; the fluctuation in lake level was maintained within a one-foot range while at the same time all water requirements of power users were fulfilled.

WATER-POWER REGULATIONS AND LEGAL RESEARCH

The translation of foreign acts and regulations has been continued during the year, and a reasonably complete set of the water-power laws now in force in Norway, Sweden, Germany, Austria, Switzerland, France, Italy, Spain, and Portugal, together with the more important regulations, instructions, and forms of concession thereunder has now been secured in English and indexed for comparative study. The French and Italian Regulations of 1920 and their supplementary decrees were translated during the past year.

The revised Dominion Water-power Regulations, pursuant to section 12 of the Dominion Water Power Act, 1919, which have been in the course of preparation for some years, were completed during the year and were approved by the Governor in Council on October 31, 1921 (P.C. 4034). The new regulations have been prepared with two main principles in view, namely, that the water-powers and the lands essential to their development now vested in the Crown should remain vested in the Crown forever, and that these same lands and water-powers should be made available for development under lease on terms sufficiently generous to ensure their development and beneficial use as soon as economically desirable, while at the same time adequately protecting the interests of the public by providing for the control of rates and rentals. These objects are to be attained by issuing licenses for the development of power and leases for the lands occupied for a fixed number of years subject to renewal under the laws and regulations then in force or to the payment of just predetermined compensation if the license terminates without being renewed at the option of the Government.

The Dominion Regulations provide for the issue of two forms of license, the interim and the final license, the former being intended to cover the survey-construction period and the latter the whole period of operation. The interim license, which may be granted at a comparatively early stage of the undertaking, subject to the approval of the director, contains a definite statement that upon the completion of the development ready to deliver power and due compliance with the conditions laid down a final license will be issued and it also embodies the principal conditions of the final license such as the term, rental during the first twenty years, and the quantity of water which may be stored or used. There is one important difference between the licensee's position as the holder of an interim or a final license. In the latter case the license cannot be cancelled for default or even seriously questioned without an order of the Exchequer Court while on the other hand an interim license may be cancelled by the Minister for default without appeal, but only provided that the licensee has expended less than one-quarter of the total amount specified in the license to be so expended.

The rental to be charged for the rights granted is assessed on an output basis, according to a sliding scale by which the rate per horse-power year decreases as the load factor increases, thus providing a direct incentive to improve the load factor with a consequent more economical use of the water leased. The rental may be revised after twenty years and every ten years thereafter, by mutual agreement between the minister and licensee or by impartial board or commission.

Compensation is provided for any property taken over by the Crown either at the end of the term of concession or if the license is terminated prior to that time on a basis of actual investment used and useful to the undertaking. In addition substantial bonuses may be allowed to meet varying conditions of termination and to cover severance losses and other intangible items. The licensee is required to file an annual statement showing renewals, extensions and depreciation. The principle of a fair rate of return on the invested capital is provided for, this rate to be cumulative so that it may be applied to early periods of operation and periods of severe depression.

The regulations deal with a number of other subjects, such as inspection during construction, control of maintenance and operation, steps which may be taken to secure enlarged development, contracts for sale of power, stream regulation and control, and special provisions intended to facilitate the development of small water-powers.

BRITISH COLUMBIA ADMINISTRATION

In the Railway Belt of British Columbia the water and water-powers, although belonging to the Dominion, are administered by the provincial authorities (except in the Dominion parks) under provincial Water Acts, and as the Dominion lands in the Belt are administered by this department it is necessary for close co-operation between the Dominion and provincial officials.

A considerable amount of engineering assistance is rendered the Department of Indian Affairs. One of the most important parts of this work is that in connection with the investigations of water rights appurtenant to the Indian Reserves of the province. Each of the five agencies affected is dealt with separately, that of the Lytton agency having been completed last year, those relating to the Kamloops, Okanagan and Kootenay agencies being completed this year and the Williams Lake agency being now under review.

The examination of water records appurtenant to lands within the Railway Belt has been continued and the work further systematized. Plans are being completed to show the lands affected in each case, and the granting of necessary right of use or occupation of Dominion lands under Water Lands Regulations is proceeding satisfactorily in co-operation with the British Columbia Lands Branch and the Forestry Branch.

WATER RESOURCES INDEX INVENTORY

The Index Inventory system for recording and collating the water resources data of the Dominion has now been in actual use for the past few years and has proved of the greatest utility in the referencing, analysis, standardization, and filing of all data relating to the subject of water resources.

Among the many phases of the work carried on by the branch to which the system has been applied there may be mentioned the complete census of developed water-power and central electric station activities and the analysis of the undeveloped water-power resources, of the stream measurement activities, and of the storage studies carried on throughout the Dominion.

Much of the work has been carried on in co-operation with other organizations, notably the Hydro-Electric Power Commission of Ontario, and the Water Rights Branch of the British Columbia Provincial Government. As a result a very large proportion of the water resources data of the Dominion are now available in standardized and usable form for whatever purpose required. A continuous effort is being made to keep this data authentic and up-to-date.

WATER-POWER RESOURCES OF CANADA

Present activity in hydro-power development warrants a further statement as to the extent of Canada's water-power resources and as to the degree of their utilization. Last year has been one of substantial progress, there having been brought into operation new installation to the extent of 300,000 horse-power, with much new construction actually proceeding and many further enterprises in prospect.

During the past two years there has been under way in the Dominion Water Power Branch a careful reanalysis and computation of the water-power resources of the Dominion. All existing stream flow and power data, available from Federal and provincial sources, have been systematically collated, analysed and co-ordinated with a view to preparing on a uniform basis from coast to coast revised estimates of the power available. While the analysis is not yet fully completed, sufficient progress has been made to warrant the publication of the figures given herein.

While the water-power resources of the country have been exhaustively analyzed in so far as the information available will permit, it should be borne in mind that only very meagre data is to hand in many districts and for many rivers. Moreover the figures given hereunder are based only on those rapids, falls and power sites of which the actual existent drop or head possible for concentration is known, or at least well established, and so may be said to represent the minimum water-power possibilities of the Dominion.

The power estimates have been calculated on a basis of 24-hour power at 80 per cent efficiency, on the basis of "Ordinary Minimum Flow" and "Estimated Flow for Maximum Development." The "Ordinary Minimum Flow" is based on the averages of the minimum flow for the lowest two consecutive seven days' periods in each year over the period for which the records are available. The "Estimated Flow for Maximum Development," is based upon the continuous power indicated by the flow of the stream for six months of the year, it being good commercial practice to develop wheel installation up to that amount on the assumption that deficiencies in power during the remaining six months can be profitably provided from storage or auxiliaries.

The recorded power available throughout the Dominion under conditions of ordinary minimum flow and within the limitations set out is 18,255,000 horse-power. The water-power available under estimated flow for maximum development, i.e., dependable for at least six months of the year, is 32,076,000 horse-power. There are installed to date throughout the Dominion water-wheels and turbines to the extent of 2,763,000 horse-power. Making an allowance of 30 per cent greater machine installation than the six months' flow actual power, which analysis of the existing plants and stream flow records indicates as an average working condition, the present recorded water-power resources of the Dominion will permit of a turbine installation of 41,700,000 horse-power. In other words, the present turbine installation represents only 6·6 per cent of the present recorded water-power resources.

The hydro-electric industry, though naturally affected by the general depression of 1921, suffered no set back, and in fact the horse-power installed during the year, 300,000 horse-power, stamps it as one of the most progressive years in Canadian water-power history.

The 2,763,000 horse-power at present installed throughout the Dominion is apportioned to the following uses:—

2,013,000 horse-power in central electric stations for general distribution purposes, such as, operation of street railways, operation of mines, operation of electro-chemical and electro-metallurgical industries, operation of pulp and paper mills, and for general industrial and domestic use.

476,000 horse-power installed in pulp and paper mills. In addition there is used in the pulp and paper industry 161,000 horse-power purchased from the central electric station installation.

274,000 horse-power installed in industries other than central electric stations and pulp and paper mills.

The total installation for the Dominion averages 315 horse-power per thousand population, a figure which places Canada second only to Norway in the per capita utilization of water-power among the countries of the world.

It is profitable to consider the history of water-power utilization in Canada during the past few years in conjunction with the present activity, with a view to making some reasonable forecast as to its probable future growth. Should the rate of water-wheel installation during the past fifteen years be maintained there will be installed in 1925, 3,360,000 horse-power; in 1930, 4,110,000 horse-power; in 1935, 4,860,000 horse-power, and in 1940, 5,600,000 horse-power. In view of the increasing appreciation of the advantages of hydro-power combined with the fortunate location of ample supplies within easy transmission distance of practically every great industrial centre throughout the Dominion, there is every reason to anticipate that this rate of growth will be accelerated rather than retarded.

In order to ensure the most beneficial utilization of these reserves and to provide intelligent guidance for their development, two essentials are required:—

First.—An accurate knowledge of the location capacity and the engineering and economic possibilities of development of the water-powers of the Dominion, together with their relationship to other natural resources of mine and forest, to industrial centres and opportunities, to transportation systems, rail and navigation, to coal and fuel supplies, to irrigation, drainage and reclamation projects, to alternate sources of power and to market for and uses of power in general.

Second.—A sound governmental policy designed to protect the public from inadvisable and ill-designed power schemes and to provide for reasonable regulation and revision of rates and rentals, and at the same time to ensure satisfactory guarantees for the encouragement of legitimate investment in hydro-power enterprises.

True conservation of our water-power resources, which are inexhaustible through use, lies not in withholding them from development but in their efficient utilization in the public interest, for the economic exploitation of our other natural resources and for the conservation of our exhaustible fuel supplies.

The water-power now developed in Canada represents an investment of $530,000,000. In 1940, should the rate of growth in installation during the past fifteen years be continued, this investment will have grown to over $1,000,000,000. The present development represents an annual equivalent of 20,500,000 tons of coal which, valued at $8 per ton, represents $164,000,000. In the year 1940 these annual figures will, with the foregoing assumption, have become 42,000,000 tons and $336,000,000. These figures are striking evidence of the outstanding importance and necessity of intelligent administrative policy governing the development of our water-power resources.

CENSUS OF CENTRAL ELECTRIC STATION INDUSTRY

During the year the fourth census of the central electric station industry of Canada was carried to completion by this branch in co-operation with the Dominion Bureau of Statistics, the Hydro-Electric Power Commission of Ontario, the Quebec Streams Commission, the Nova Scotia Power Commission, the New Brunswick Electric Power Commission and other provincial departments.

A detailed analysis of the data gathered has been made and a general census and statistical digest of the industry as at January, 1922, together with the necessary explanatory text, is now being published. Copies of this report may be obtained upon application to the Dominion Bureau of Statistics.

An outstanding feature of the statistics given in the report is the substantial increase which has taken place in the industry despite the widespread financial and industrial depression. In numbers the stations have increased from 805 at the end of 1919 to 819 at the end of 1920, the capital and total primary power increasing

from $416,512,010 and 2,024,918 horse-power to $448,273,642 and 2,033,616 horse-power respectively. Gross earnings have risen from $57,853,392 to $65,705,060, an increase of 13·5 per cent, although this has been offset by an increase in the total operating expenses from $34,341,923 to $45,100,946.

One of the most striking features of the report is the great predominance of water as a source of energy.

Of the total primary power installation of 1,917,811 horse-power in main plants water-power provides the motive force for 1,754,130 horse-power, or 91·4 per cent. While this figure shows the extent to which water-power is used, reference to the provincial totals as set forth in the report shows that all parts of the country are about equally well served and that it is only in the coal areas of the middle west that hydro-electric power is not readily available. Here, because of the ready accessibility of cheap fuel, the absence of water-power has not been a serious drawback to the development of the industry.

The total production of energy for the year amounted to 5,894,867,000 kilowatt hours, of which 5,730,304,000 kilowatt hours or 97·2 per cent, was produced in hydraulic stations. The extent and value of Canada's water-powers is indicated when it is stated that the cost of coal at $8 per ton necessary to produce this amount of electrical energy would amount to practically one hundred and eight millions of dollars.

DOMINION HYDROMETRIC SURVEY

The consolidation in July, 1920, of all the stream measurement work of the Department of the Interior and the formation within the Dominion Water Power Branch of a Dominion Hydrometric Survey has during the past year permitted a fairly complete co-ordination of effort. This central control has removed the possibility of duplication, enabled the institution of more efficient and economic methods of collecting and disseminating hydrometric records, and permitted the publication of the data in conformity with the major drainage basins of the country and its distribution from one central office.

With the exception of certain of the Pacific Coast tributaries, no abnormal flood conditions obtained in the past year. On the other hand, run-off was sub-normal in the southern parts of Alberta and Saskatchewan and also in the Maritime Provinces. Elsewhere in Canada the run-off was average.

Hydrometric Surveys in the Pacific Coast Drainage have been continued under the direction of R. G. Swan, M.E.I.C., District Chief Engineer, at Vancouver, in closest co-operation with the Water Rights Branch of the Provincial Government and with the Department of Indian Affairs and by request, additional stations, essential to irrigation projects, were established in the interior dry belt. Special investigations necessary to a consideration of an international use of boundary rivers were made during the year of Pend-d'Oreille, Kootenay, and Skagit rivers.

In Alberta and Saskatchewan stream measurement work has been carried on under the direction of A. L. Ford, M.E.I.C., District Chief Engineer at Calgary. As a result of deficient precipitation in the southern portion of the two provinces for the fifth consecutive year there has been a most pressing demand for the fullest investigation of water resources for irrigation purposes, necessitating a material increase in field investigations. At the current meter rating station in Calgary the regular and a special meter rating service were maintained. Other special field work included a flood prediction survey in the Bow River valley and an investigation of absorption losses in Lake Newell reservoir.

Under the direction of C. H. Attwood, A.M.E.I.C., District Chief Engineer at Winnipeg, the work in Manitoba and in Ontario west of the Nipigon river has been continued as previously. At the request of the Manitoba Drainage Commission special investigations were made of the flood run-off of many of the small streams

in the southern portion of the province. International problems relating to the use of boundary waters to which attention was given during the year include the Red, Roseau and Pigeon rivers.

Stream measurement work in Ontario has been continued under the direction of S. S. Scovil, M.E.I.C., District Chief Engineer at Ottawa, in close co-operation with the Hydro-Electric Power Commission of Ontario. In the mining and pulp district north and west of North Bay the field work has been extended to meet the demands of prospective power development. A special office and field investigation of the complex hydrology of the upper Niagara river has been in progress.

In New Brunswick, Nova Scotia, and Prince Edward Island, the hydrometric survey has been continued under the direction of K. H. Smith, M.E.I.C., District Chief Engineer at Halifax. In each province the fullest measure of co-operation has been maintained with the provincial authorities. During the year run-off was greatly deficient and invaluable low-flow records were obtained. Certain special studies were also carried on in connection with storage and stream flow regulation.

DOMINION WATER-POWER AND STORAGE SURVEYS

The power and storage investigations carried out by the department during the past year in various parts of the Dominion, under the supervision of Mr. Norman Marr, A.M.E.I.C., were chiefly confined to projects of immediate interest. The office analyses of water-power possibilities throughout the country were also actively carried forward both in the head office and the various field offices.

A study was made of the hydrology of the Columbia river to determine the effects, if any, on Canadian interests of the proposed Kootenay Flats and of the Columbia Basin reclamation projects. The analysis of the water-power resources of British Columbia was actively carried on in co-operation with the Provincial Water Rights Branch.

In the Northwest Territories a reconnaissance power survey was made of Alexandra and Louise falls, on the Hay river, about forty-five miles from its mouth. These powers are of importance with regard to the development of mineral deposits in the vicinity of Great Slave lake.

In Alberta a reconnaissance power survey was made of the Smith rapids, on the Slave river, near the northern boundary of the province. At Bow falls, on the Bow river, in Banff, additional topographic details were secured in connection with the proposed power development by the Dominion Parks Branch. A reconnaissance of the lower Cascade river was made in co-operation with the Calgary Power Company in connection with a proposed power development on that river to augment the capacity of the company's existing plants. Attention was given to applications for power sites on the Crowsnest and Belly rivers. Responsibility for the operation of the Lake Minnewanka storage during the filling season was assumed by the department with very satisfactory results. The systematic analysis of the water-power resources of northern Saskatchewan was continued during the year.

In Manitoba an investigation was made of the possibility of developing power on Birdtail creek, at Birtle, and installing a hydro-electric system in the town. Close co-operation was maintained with the Manitoba Power Commission.

In Ontario a reconnaissance survey of the Winnipeg River watershed was made with reference to the power possibilities of the upper English river above Lost lake and also of its tributary the Sturgeon river. The analysis of the water-power resources of the province was continued in co-operation with the Ontario Hydro-Electric Power Commission.

In Quebec the systematic analysis of the water-power resources, developed and undeveloped, was continued, based on the extensive investigatory work carried out by the Quebec Streams Commission and upon other existing sources of reference both federal and provincial.

In New Brunswick a detailed power survey of some seven miles of the Nepisiquit river was commenced in co-operation with the New Brunswick Electric Power Commission and will be continued during 1922. At the request of municipalities and others who were considering hydro-electric development on a small scale, the following streams were investigated: Upsalquitch river, Caraquette river, Tracadie river, Little Tracadie river, Green river, and Gaspereau river.

In Nova Scotia a detailed power and storage survey of the Bear river was made in co-operation with the Nova Scotia Power Commission. Investigations of the following small streams were also carried out at the request of municipalities and others: Waugh river, Mulgrave brook, Gibraltar Lake stream, Little river, and the Maligeak lake outlets.

In Prince Edward Island at the request of the municipality of Souris an investigation was made of the power possibilities of the Souris river.

FLOODED LAND SURVEYS

Dominion land surveys of overflowed lands as they affect the administration of water-power were carried on during the year under the direction of T. H. Dunn, D.L.S., M.E.I.C.

The location of the boundary of the power reserve on lac du Bonnet was commenced in 1921 at the east boundary of township 17, range 12, E.P.M., and continued westward to range 11 and south to the north boundary of township 15, where closure was made, completing the survey of the power reserve around lac du Bonnet and of the Winnipeg river within township 16.

The survey of the power reserve along the Pinawa channel was recommenced at the north boundary of section 29, township 14, range 12, E.P.M., and extended to the northeast corner of section 11, township 14, range 12, E.P.M. This practically completed the survey of the Pinawa channel.

In sections 3 and 16 of townships 16, range 11, E.P.M., the banks do not rise to elevation 830 and a dyke 2·4 miles long along the Winnipeg River railway will be found necessary to prevent overflow, and improved drainage facilities will have to be provided for in Catfish creek.

A topographical survey of that portion of sections N. ½, 30, 31, 32, and NE. ¼, 33, township 13, range 36; section 5, township 14, range 12, and SE. ¼, section 36, township 13, range 11, south of the Winnipeg river, was made and contours 900 feet, 903 feet, and 905 feet located to determine the most feasible location for a dyke to connect the proposed dam at the upper Seven Sisters power site with the 905-foot contour, section 32, township 13, range 12. The total length of this dyke in addition to the necessary embankment at the dam site will be 1·75 miles.

During the season 68 miles of section line and 46 miles of chained traverse were run, making a total of 114 miles. This necessitated the construction of 108 section corner monuments and the planting of 277 posts at traverse corners. The total number of posts used was 385, of which 362 were long standard and 23 were short standard posts.

PUBLICATIONS

Annual Reports, Water Resources Papers, which embody the results of investigations of the various engineers of the branch, and special pamphlets and bulletins relating to water-powers are prepared for distribution to the public. A list of these may be had upon application.